



The Effects of Terrorist Attacks on Symptom Clusters of PTSD: a Comparison with Victims of Other Traumatic Events

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Abstract

In the Post-Traumatic Stress Disorder (PTSD) literature, no study assessed differences in symptom clusters among victims of terrorist attacks (TA) as compared with victims of other traumatic events. Due to the intentional nature of the harm infliction, TA may be expected to produce more severe symptoms, particularly avoidance, since this cluster was found to be a severity marker and a maintenance factor of the disorder. As several patients delay treatment-seeking, duration of untreated illness (DUI) is another problem potentially influencing PTSD severity. The current study explored differences in PTSD symptom clusters as a function of the traumatic event type (TA compared with other events), DUI, and sex. One hundred-eight patients with primary PTSD were administered The Clinician Administered PTSD Scale. Mean DUI was approximately 12 years, irrespective of the event type. Patients who had experienced TA had significantly more severe Avoidance/Numbing symptoms and general PTSD severity than those who had experienced other events. No significant effects emerged for DUI and sex on all clusters. Timely recognition and intervention on PTSD may include community psychoeducation programs about its symptoms. Tailored intervention on TA-related PTSD may focus on Avoidance/Numbing by including medication and psychotherapeutic approaches for this symptom cluster.

Keywords Terrorism · Trauma · Avoidance · Stress · Victims · Numbing

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Introduction

Symptom Clusters of Post-Traumatic Stress Disorder

Post-Traumatic Stress Disorder (PTSD) is one of the most common psychological reactions to a life-threatening event [1]. According to DSM-5 [1], it includes specific symptom clusters, typically arising within the first three months since the event: (a) Re-experiencing symptoms of the event, by means of nightmares, flashbacks, and intrusive memories, (b) Avoidance of reminders of the event, (c) Hyperarousal symptoms (hypervigilance, impaired concentration, increase in startle response, and anger outbreak). About 18%–50% of patients experience stable recovery within 3–7 years, while the remaining individuals face a chronic course [2]. Specific symptom clusters may be associated with long-term maintenance of the disorder: in victims of physical/sexual assault, long-term persistence of PTSD was higher if the victim showed avoidance as a maladaptive coping strategy [3]. The two-Factor Learning Theory by Mowrer [4] and the cognitive behavioural model of PTSD [5] assumed that avoidance behaviour is either a marker of clinical severity and a maintenance process involved in the persistence of PTSD playing as a negative reinforcement of symptoms. Repetitive avoidance of trauma-related external/internal stimuli that trigger emotional arousal, has the short-term effect of reducing trauma-related arousal but can reinforce it at long-term through operant conditioning process producing a chronicization process of symptoms and higher severity [4, 5].

Also demographic variables, specifically sex, were found to be associated with PTSD risk and severity, despite not all the data appeared consistent each other. Women were found having a moderately higher risk of PTSD, irrespective of the event type they have been exposed to [6]. Female sex was also associated with higher physiological reactivity to reminders [7] and avoidance/numbing symptoms [8], while other reports showed that female sex was associated with more severity in all clusters [9]. In other research, however, PTSD was not more prevalent and more severe among women than men [10, 11].

Traumatic Event Type and PTSD Symptom Clusters

A key element of PTSD is that its manifestations are related to the life-threatening nature of the event [1]. It was speculated that the characteristics of the event type can moderate the clinical picture of PTSD [12]. Some authors found no difference in severity of symptom clusters across different event types, concluding that clusters develop independently from the event type [13].

Despite the literature has yet to provide a theoretically consistent distinction between event types, some researchers distinguished disasters, classified as human-made, technological and natural, from individual events [14]. Human-made and technological disasters have been documented to produce more severe psychological consequences than natural disasters [15]. Prevalence rates of PTSD were found to be lower following technological accidents than those involving a human perpetrator [16]. Some research focused on terrorist attacks (TA) for their unexpected nature associated with life threat [17]. Survivors of TA have higher rates of PTSD than motor vehicle accident survivors (37.8% versus 18.7%) [18]. Among individuals directly exposed to TA, PTSD is six-to eightfold more prevalent than among those who have experienced indirectly the event [19]. Other researchers hypothesized that the key characteristic of TA is the intentional infliction of harm [20]. A systematic review on the mental health

outcomes of natural and man-made disasters showed that events characterized by intentional violence, particularly TA, predicted more impairing psychological consequences and more severe PTSD than disasters not involving intentional human malfeasance [21].

Duration of Untreated Illness in PTSD

Originally investigated in psychosis, duration of untreated illness (DUI) is the time elapsed between symptom onset and the first treatment [22]. The concept of DUI has prognostic utility, given its relation with negative long-term outcomes [22]. DUI was a factor complicating the picture of PTSD after TA [23], suggesting the need for early intervention in PTSD [24]. Most people with PTSD either do not receive, or delay seeking, treatment for years following onset, for several reasons, including lack of symptom awareness or specialized services [24]. Median time to remission was 3 years for respondents who had ever sought treatment and 5 for those who had not [25]. In a meta-analysis, mean remission rates at follow-up were 44.0%, but they varied from 8 and 89% depending upon time of first treatment: in studies with the baseline within the first 5 months following trauma, remission rate resulted 51.7% as compared to 36.9% in studies with the baseline later than 5 months [24].

Rationale and Objectives

The traumatic event type may be associated with distinct PTSD symptom clusters [26]. Differences in symptom clusters among TA victims compared with victims of other traumas were not yet explored in the current PTSD literature. Evidence about the clusters associated with TA may suggest personalized approach for TA-related PTSD focusing on specific clusters. Due to the unexpected and intentional nature of the harm and its stronger association with PTSD risk than other event, it may be hypothesized that TA is likely to produce more severe symptoms. According to Two-Factor Learning [4] and cognitive behavioural theories [5], Avoidance/Numbing symptoms were maintenance factors of PTSD. In the current study, it was hypothesized that TA was associated with more severe Avoidance/Numbing symptoms and higher general severity. Another variable under-investigated in PTSD is DUI. No study examined whether DUI is associated with more severe specific symptom clusters. Studying DUI may support early intervention on those clusters showing higher long-term severity. According to Two-Factor Learning and cognitive behavioural theories of PTSD [4, 5], it was hypothesized that longer DUI was associated with more general severity and more severe Avoidance/Numbing symptoms: this symptom cluster may be associated with longer DUI, as not seeking treatment may be due to avoidance behaviour of trauma-related external and internal stimuli, which can reduce negative arousal at short-term but can maintain symptoms at long-term. Finally, another variable considered in the present study was sex. As in most of the literature women were found having higher general severity and higher severity in all clusters, irrespective of the event type they have been exposed to [6–11], PTSD general and all symptom cluster severity was hypothesized to be higher among women. Therefore, the current study explored differences in severity of PTSD symptom clusters as a function of the type of traumatic event (TA compared with other events), DUI, and sex.

Methods

Participants' Inclusion/Exclusion Criteria

Inclusion criteria were (a) reason for seeking treatment was PTSD, (b) PTSD primary diagnosis according to DSM-IV-TR criteria [27], developed after TA or another traumatic event (car/work accident, earthquake), (c) 18–65 year age, (d) written informed consent. Exclusion criteria were (a) comorbid psychiatric diagnoses (Axis I/II disorders), (b) mental retardation, (c) neurological conditions, (d) concurrent psychotropic medication or psychotherapy, (e) prior treatment for PTSD (both psychopharmacological and psychotherapeutic).

Participants were treatment-seeking consecutive patients, referred by practitioners or self-referred, recruited at the Department of Psychiatry of Santa Maria alle Scotte University Hospital of Siena and at the National Observatory for Victims of Terrorism during the first psychiatric visit. In accordance with the Helsinki Declaration [28], patients provided written informed consent.

Measures

Screening on Psychiatric Disorders

Axis I disorders were assessed through the Structured Clinical Interview for DSM-IV-TR Axis I Disorders [SCID-I; 29; Italian; 30]. Personality disorders were investigated through the Structured Clinical Interview for DSM-IV-TR Personality Disorders [SCID-II; 31; SCID-II Italian 32]. The SCID-I and the SCID-II were administered by psychiatrists trained by reading manuals of the interviews and participating in workshops/role-playing on the administration of the instruments.

PTSD Symptoms

The Clinician Administered PTSD Scale [CAPS; 33], 30-item semi-structured interview, was used to measure frequency/intensity of PTSD symptoms. It showed good-to-excellent inter-rater reliability and criterion validity in veteran samples [34]. The CAPS was administered by psychiatrists trained by reading the manual and internships/role-playing where they saw the administration of the instrument by a psychiatrist experienced with the CAPS.

In accordance with Norman and Malla [22], PTSD DUI, investigated during the interview, was measured as the time elapsed between the onset of PTSD symptoms and the day when the patient was seeking treatment.

Statistical Analysis

One-way ANOVA/chi squared tests were conducted to compare demographic/clinical characteristics of the groups. Effect sizes were calculated as Cohen's *d* [35]. For this analysis, results of a-priori power analysis suggested that to detect medium effect size with 70% power, the requested sample size was 102. To investigate the effects of the event type, DUI and sex, univariate general linear models were run, entering scores on the CAPS total/subscales as outcomes, sex and type of traumatic event (TA versus other event) as random factors and DUI in months as covariate. Main effects of event type, sex and DUI and interaction effect (DUI x

event type) were analysed, since significant difference was found between TA and other events on DUI. Effect sizes were calculated as squared Eta (η^2) according to Olejnik and Algina [36]. Following Cohen [35], effect sizes of 0.01, 0.06, and 0.14 were interpreted as small, medium, and large, respectively. Significance was set at $p < 0.05$. The analysis was conducted by SPSS version 21.00.

Results

Demographic/Clinical Characteristics

From 300 initially screened patients, 108 consecutive treatment-seeking patients were enrolled (Table 1). The participants' flowchart is presented according to STROBE [37] in Fig. 1. In the total group, mean age was 46.44 years ($SD = 10.87$) and 50 patients (46.30%) were females. Forty-four patients developed PTSD after TA and 64 after other events. No significant difference was found between the groups on the CAPS total and subscale scores. A significant between-group difference emerged in DUI in months: patients in the TA group reported significantly higher PTSD DUI than those in the other event group [$F_{(1, 106)} = 19.33$, $p < 0.001$] with large effect size.

Effects of Event Type, Sex and DUI on Symptom Clusters

A significant main effect of event type emerged on CAPS Avoidance/Numbing scores with large effect size and, at borderline significance, on CAPS Total scores with medium effect size: those patients who had experienced TA had significantly higher scores on the CAPS Avoidance/Numbing subscale and higher scores on the CAPS Total. No significant main effects emerged for traumatic event type on the other CAPS subscale scores; no significant main effects emerged for DUI and sex on all CAPS subscale/total scores (Tables 2, 3, 4 and 5).

Discussion

In the current PTSD literature, there is little knowledge about the role of the event type on the symptom clusters. No study explored PTSD symptom clusters in victims of TA compared with victims of other events. Due to its unexpected nature, to the intentional meaning of the harm and its stronger relation with PTSD risk than other events, it may be hypothesized that TA can produce more severe symptoms. Another unexplored variable is PTSD DUI and its relation with the symptom clusters. Previous research on mental disorders showed that longer DUI was associated with more severity. The current study investigated differences in severity of PTSD symptom clusters as a function of the traumatic event type, DUI, and sex in PTSD patients who had experienced TA or other events.

Mean DUI was approximately 12 years, irrespective of the type of traumatic event. This finding suggested the importance of a timely recognition and intervention in PTSD. Consistent with Friedman [38], a clinical implication for practice might be the development of community psychoeducation programs provided to general population about post-traumatic symptoms/signs and how recognizing them. These programs may be helpful either for victims and their caregivers in recognizing the first stages of PTSD and seeking adequate help. It may be

Table 1 Demographic/clinical characteristics of terrorist attack and other event groups

	Total group (<i>n</i> = 108) <i>n</i> (%) / <i>M</i> (<i>SD</i> ; range)	Terrorist attack (<i>n</i> = 44) <i>n</i> (%) / <i>M</i> (<i>SD</i> ; range)	Other traumatic events (<i>n</i> = 64) <i>n</i> (%) / <i>M</i> (<i>SD</i> ; range)	χ^2 <i>F</i> _(1, 106)	Cohen's <i>d</i>
Female sex	50 (46.30)	19 (43.20)	31 (48.40)	3.70	
Age (years)	46.44 (10.87; 19–65)	48.66 (10.35; 21–65)	44.92 (11.05; 19–64)	3.13	0.35
DUI (months)	137.29 (139.07; 1–480)	202.86 (155.39; 12–432)	92.20 (106.31; 1–480)	19.33**	0.83
CAPS total	57.42 (18.35; 15–97)	59.12 (19.09; 24–94)	56.25 (17.89; 15–97)	0.63	0.15
CAPS Re-experiencing	58.68 (22.75; 5–138)	60.34 (20.20; 20–100)	57.54 (24.44; 5–138)	0.39	0.13
CAPS Avoidance/Numbing	52.03 (20.27; 11–96)	54.02 (21.42; 11–96)	50.67 (19.49; 11–96)	0.71	0.16
CAPS Hyperarousal	63.50 (20.73; 13–100)	64.09 (23.11; 13–95)	63.09 (19.10; 20–100)	0.06	0.05

CAPS Clinician Administered PTSD Scale; *DUI* Duration of Untreated Illness; *PTSD* Post-Traumatic Stress Disorder

**p* < 0.05, ** *p* < 0.001

hypothesized that in the first phases after trauma, the victim is less aware of the impact of the trauma due to suppression/minimization coping used as emotion regulation [39].

Consistent with the Two-Factor Learning Theory by Mowrer [4] and the PTSD cognitive behavioural model [5], controlling for DUI and sex, TA was associated with more severe Avoidance/Numbing and higher PTSD severity. This evidence suggested that TA-related PTSD may consist of a more severe clinical picture, where avoidance-based coping may play as maintenance factor of symptomatology [5]. It may be speculated that the specific characteristics of a TA, particularly the intentional nature of the harm, may produce more severe Avoidance/Numbing symptoms. In addition, this supported the need for tailored intervention on Avoidance and Numbing symptoms in PTSD developed after TA. Evidence about the role of Avoidance as severity marker is in line with previous research. For example, in victims of physical/sexual assault, long-term maintenance of PTSD was higher if the victims showed avoidance after the trauma [3]. Presence of Avoidance/Numbing symptoms interferes with the habituation process, in line with emotional processing theory [40]. However, evidence from a recent meta-analysis [41] showed that early intervention based on trauma-focused cognitive behavioural therapy is associated with moderate significant effect on avoidance (effect size = 0.58, $p < 0.001$). Some research and clinical observations suggested that it is often very hard to treat patients with avoidance symptoms through exposure techniques [42]. Those who reported

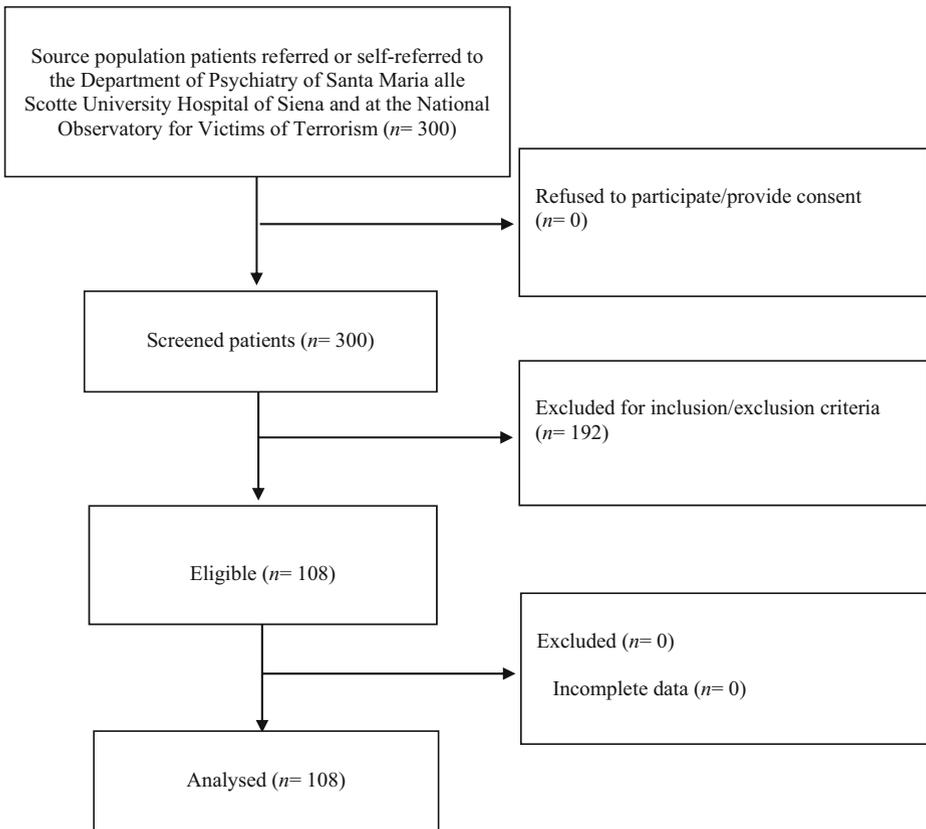


Fig. 1 Flowchart according to STROBE recommendations

Table 2 Effects of DUI, sex and traumatic event type on CAPS Re-experiencing scores

Parameters	β	SE	t	p value	95% CI		Partial η^2	Observed power
					Lower	Upper		
Intercept	57.17	4.16	13.72	< 0.001	48.90	65.43	0.64	1.00
Female sex	3.92	4.38	0.89	0.37	-4.76	12.61	0.01	0.14
TA	11.15	6.75	1.65	0.10	-2.23	24.55	0.02	0.37
DUI	-0.1	0.02	-0.62	0.53	-0.07	0.03	0.01	0.09
TA x Duration of untreated PTSD	-0.03	0.03	-0.89	0.37	-0.10	0.03	0.01	0.14

CAPS Clinician Administered PTSD Scale; *DUI* Duration of Untreated Illness; *PTSD* Post-Traumatic Stress Disorder; *TA* Terrorist Attack

more severe avoidance symptoms failed to attend to prolonged sessions of exposure regularly due to low trauma exposure tolerance [43]. It might be that treatment for the subgroup of cases with TA-related PTSD may benefit from therapeutic strategies increasing exposure tolerance.

A significant relation was found also between TA and Numbing symptoms. Some authors postulated that Numbing is a result of a draining of processing resources to positively-valenced stimuli that have been impeded by exposure to trauma cues [44]. Thus, Numbing could be an epiphenomenon of low behavioural activation and deprivation of positive reinforcers caused by avoidance of pleasant activities. This suggested the need for treatments explicitly aimed at countering numbing symptoms in TA-related PTSD. Some clinical implications of this result may be suggested. As patients with TA-related PTSD showed more severe Avoidance/Numbing, for this subgroup of patients augmentation of Selective Serotonin Reuptake Inhibitors with mood stabilizers may improve the outcome, as they are expected to decrease baseline level of anxiety before exposure therapy. For example, oral administration of Valproic Acid before fear extinction training facilitated fear extinction, consolidation, and habituation and protected against fear reinforcement [45]. Moreover, administration after fear extinction training facilitated the offline consolidation processes [46]. Recently, D-Cycloserine has been found to be effective on Avoidance/Numbing symptoms, as it is able to increase the patient's willingness to exposure and facilitate habituation [47]. Treatment modules based on a novel psychotherapeutic approach, Acceptance and Commitment Therapy [ACT; 48] have been found to be promising. ACT might be included in the management of TA-related PTSD with the aim to increase the willingness to expose to traumatic stimuli, as ACT can reduce

Table 3 Effects of DUI, sex and traumatic event type on CAPS Avoidance/Numbing scores

Parameters	β	SE	t	p value	95% CI		Partial η^2	Observed power
					Lower	Upper		
Intercept	51.27	3.71	13.82	< 0.001	43.91	58.63	0.65	1.00
Female sex	0.01	3.90	0.01	0.99	-7.72	7.74	0.01	0.05
TA	12.17	6.01	2.02	0.04	0.248	24.10	0.03	0.51
DUI	-0.01	0.02	-0.27	0.78	-0.05	0.04	0.01	0.05
TA x Duration of untreated PTSD	-0.04	0.03	-1.28	0.20	-0.10	0.02	0.02	0.24

CAPS Clinician Administered PTSD Scale; *DUI* Duration of Untreated Illness; *PTSD* Post-Traumatic Stress Disorder; *TA* Terrorist Attack

Table 4 Effects of DUI, sex and traumatic event type on CAPS Hyperarousal scores

Parameters	β	SE	t	p value	95% CI		Partial η^2	Observed power
					Lower	Upper		
Intercept	63.33	3.87	16.34	< 0.001	55.65	71.02	0.72	1.00
Female sex	-1.81	4.07	-0.44	0.65	-9.89	6.26	0.01	0.07
TA	6.84	6.28	1.09	0.27	-5.60	19.30	0.01	0.19
DUI	0.01	0.02	0.27	0.78	-0.04	0.05	0.01	0.05
TA x Duration of untreated PTSD	-0.03	0.03	-1.01	0.31	-0.07	0.03	0.01	0.17

CAPS Clinician Administered PTSD Scale; *DUI* Duration of Untreated Illness; *PTSD* Post-Traumatic Stress Disorder; *TA* Terrorist Attack

experiential avoidance through its values and acceptance components [48]. Another psychotherapeutic implication for TA-related PTSD may be the use of social rhythm therapy, which has shown to be promising for PTSD associated with mood impairment [49].

Several processes may explain why Avoidance/Numbing may interfere with natural recovery. For example, they make the individual less likely to develop alternative re-appraisals, less aware of the impact of trauma due to low mood and negation defensive mechanisms, or they produce depressive feelings of resource loss [50].

The lack of a significant relation between event type and Re-experiencing and Hyperarousal suggested that these two clusters may be independent from the content and the characteristics of the event. This also was in line with evidence showing that Re-experiencing is a general maintaining process of PTSD independent from the type of the event and the time since the event, as it can enhance long-term persistence during all the course of the disorder irrespective of the event type [51].

The lack of a significant association between DUI and symptom clusters showed that, despite it has direct effect on the course of most mental disorders, in the current study DUI was not associated with more severity. This appeared in contrast with research demonstrating that support-seeking coping was associated with lower PTSD risk and severity [52] and in contrast with the hypotheses that if untreated, PTSD gets worse at long-term [53].

Finally, sex was not associated with different severity in the symptom clusters. This was in contrast with our hypothesis that women reported higher general and all symptom cluster severity. The present findings were also inconsistent with previous evidence reported in international literature showing women having higher general severity and higher severity in

Table 5 Effects of DUI, sex and traumatic event type on CAPS Total scores

Parameters	β	SE	t	p value	95% CI		Partial η^2	Observed power
					Lower	Upper		
Intercept	56.44	3.37	16.74	< 0.001	49.75	63.12	0.731	1.00
Female sex	0.52	3.54	0.14	0.88	-6.50	7.54	0.001	0.05
TA	10.58	5.46	1.93	0.05	-0.25	21.41	0.03	0.48
DUI	-0.01	0.02	-0.22	0.82	-0.04	0.03	0.001	0.05
TA x Duration of untreated PTSD	-0.03	0.02	-1.25	0.21	-0.09	0.02	0.01	0.23

CAPS Clinician Administered PTSD Scale; *DUI* Duration of Untreated Illness; *PTSD* Post-Traumatic Stress Disorder; *TA* Terrorist Attack

all clusters, irrespective of the event type they have been exposed to [6–11] or that women are more likely to develop avoidance symptoms and numbing/depressive symptoms [54]. Cultural differences between previous studies and the present one may explain this discrepancy. For example, some data from European surveys suggested that in comparison with those of other countries, Italian patients reported more positive attitudes towards seeking help from mental health professionals and expressing their psychological reactions/emotion, regardless of sex [55]. However, it should be noted that the current data were in line with other studies where PTSD was not more prevalent and more severe among women than men [10] and with a meta-analysis where sex was not a predictor of PTSD risk [11].

Conclusions

Some limitations should be pointed out. Since Avoidance and Numbing symptoms were assessed through the same subscale of the CAPS, the specific impact of TA on these two clusters was not explored. Differences between TA and other events by differentiating these two clusters should be explored. Avoidance and Numbing might interact each other in a helplessness/hopelessness cycle: on one hand, patients reacting to the event by avoiding trauma-related situations, may be more likely to develop numbing; on the other hand, patients reacting to trauma with emotional flattening, are more likely to avoid trauma-related situations. Moreover, due to the cross-sectional design, the study did not examine the trajectories of the clusters across all the phases after the trauma. TA might be associated with different trajectories than other events. Other clinical variables linked to PTSD [56], such as prior psychiatric disorders, may be explored. Future prospective research is required: this might clarify whether a staging model fits the disorder [57]. A further area needing for investigation is the comparison between TA and other events characterized by the intentional nature of the harm, such as rape. Finally, another point to be evaluated is avoidance coping, such as smoking or metacognitive strategies (eg, suppression of intrusions).

In conclusion, TA-related PTSD appeared a specific subtype characterized by more severe Avoidance/Numbing and more general severity, beyond the effect of sex and the time period during which symptoms remain untreated.

Compliance with Ethical Standards

Conflict of Interest Andrea Pozza declares that he has no conflict of interest.

Letizia Bossini declares that she has no conflict of interest.

Fabio Ferretti declares that he has no conflict of interest.

Miriam Olivola declares that she has no conflict of interest.

Laura Del Matto declares that she has no conflict of interest.

Serena Desantis declares that she has no conflict of interest.

Andrea Fagiolini declares that he has no conflict of interest.

Anna Coluccia declares that she has no conflict of interest.

Ethical Approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards. This article does not contain any studies with animals performed by any of the authors.

Informed Consent Informed consent was obtained from all individual participants included in the study.

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