

Estimates of Prevalence and Criteria Comparison in DSM-5 versus DSM-IV-TR Post-Traumatic Stress Disorder in 111 Survivors to the 2009 Railway Accident in Viareggio-Italy

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ABSTRACT: *The fifth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5) introduced noteworthy revisions to Post-Traumatic Stress Disorder (PTSD) criteria, including a four-factor model and some new symptomatic criteria. To date, only a limited number of studies investigated the impact of such changes on the prevalence rates of the disorder. On 29 June 2009, in the railway station of Viareggio (Italy), a freight train carrying liquefied petroleum gas derailed with a subsequent fire leading to a large area of the town being damaged: 32 people died and 26 were severely injured. A total sample of 111 subjects who survived to the railway accident were assessed for PTSD according to either DSM-5 or DSM-IV-TR criteria by means of a spectrum assessment instrument: the Trauma and Loss Spectrum-Self Report (TALS-SR).*

A DSM-5 PTSD diagnosis emerged in 50.4% with respect to 54.7% according to DSM-IV-TR criteria. Most of the subjects fulfilling DSM-IV-TR but not DSM-5 criteria did not endorse new Criterion C (active avoidance). For what concern new DSM-5 PTSD symptoms: 1 (2.6%) survivor endorsed symptom D3; 29 (76.32%) D4; 6 (15.79%) both D3 and D4; 8 (27.59%) E2. This is the first study to report PTSD prevalence rates among survivors to the Viareggio 2009 railway accident. Our results corroborate the substantial equivalence between the DSM-5 and DSM-IV-TR algorithms for PTSD diagnosis and further suggest that avoidance and/or negative alterations in cognition and mood should alert the clinician for possible PTSD development.

PTSD diagnostic criteria have been changed in the recently released DSM-5	The present study:
Few studies have so far investigated how these changes may affect the diagnosis of PTSD	-reports about the prevalence of PTSD among individuals seeking for treatment in the aftermath of a human made disaster in an Italian sample
Growing data are accumulating about PTSD prevalence in clinical and epidemiological samples	-shows the differential fulfillment of a diagnosis of PTSD according to either DSM-5 or DSM-IV-TR criteria
However, data about PTSD following a human made disaster are scant, at least in European populations	-highlights which early symptoms may alert the clinician of a higher risk of developing PTSD

INTRODUCTION

Post-Traumatic Stress Disorder (PTSD) is worldwide recognized as the most frequent mental disorder occurring in the aftermath of traumatic exposure and increasing research has been focused on its detection in general population samples exposed to both natural and human made disasters, particularly in Italy (Kessler et al., 1995; Kessler, 2000; Faravelli et al., 2004; Dell’Osso et al., 2011; 2013; Carmassi et al., 2013; 2014 a,b).

The number of clinical and epidemiological studies developed since the first inclusion of PTSD within psychiatric nosographic system in 1980 (Diagnostic and Statistical Manual of Mental Disorders 3rd edition, DSM-III, American Psychiatric Association, 1980), led to the important changes acknowledged for this disorder in the DSM-5 (American Psychiatric Association, 2013). Primarily, for the first time it was included in a new chapter specifically devoted to *Trauma and Stressor-Related Disorders*, separated from other anxiety disorders, highlighting the peculiarity of Post-Traumatic Stress reactions. Further, significant changes were addressed to diagnostic criteria, for what concern both trauma and/or stressor and

the symptoms structure. The revised DSM-5 criterion A defining the traumatic event, corresponding to the former DSM-IV-TR (American Psychiatric Association, 2000) PTSD criteria A1 and A2, redefines the range of traumatic events encoded in the former besides deleting the latter (subjective reactions of intense fear, helplessness or horror to the stressor event). Further, the revised symptoms criteria include three new symptoms besides replacing the three-factor model of PTSD (i.e., Cluster B re-experiencing symptoms, Cluster C, avoidance/numbing symptoms, and Cluster D, hyper-arousal symptoms) with a new four-factor model (consisting of Cluster B intrusion symptoms, Cluster C persistent avoidance, Cluster D alterations in cognitions and mood, and Cluster E hyper-arousal and reactivity symptoms).

There is great interest in the effect that new DSM-5 criteria could have on the detection of the disorder. A few studies have so far evaluated the possible changes in PTSD prevalence investigated with the altered DSM-5 symptom criteria (Elhai et al., 2012; Calhoun et al., 2013; Carmassi et al., 2013; 2014a; Miller et al., 2014). While some reported a slight increase in PTSD observed prevalence rates with the new criteria (Elhai et al., 2012) while other a slight decrease (Forbes et al., 2011). In a previous study (Carmassi et al., 2013) on survivors to the 2009 earthquake in L’Aquila, Italy, some of us reported a DSM-5 PTSD diagnosis in 39.8% of subjects, with a significant difference

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between the two sexes ($p < 0.001$), and an overall 87.1% consistency with DSM-IV-TR. Most of the inconsistent diagnoses that fulfilled DSM-IV-TR criteria but not DSM-5 criteria could be attributed to the subjects not fulfilling the new criterion (active avoidance). In the same sample significant gender differences emerged in almost half of PTSD symptomatological criteria with women reporting higher rates in 8 of them, while men in only one (Carmassi et al., 2014a).

On 29 June 2009, at 11.48 p.m., in the railway station of Viareggio (Italy) a freight train carrying liquefied petroleum gas (LPG) derailed and two of them exploded causing a fire. A whole street alongside the railway was destroyed in the explosion. Thirty-two people died (8 immediately at the time of explosion while 24 after being hospitalized for physical trauma and burns), and 26 people were injured. A large area of Viareggio was damaged in the subsequent fires and around 1,000 residents of Viareggio were evacuated from their homes.

To the best of our knowledge, despite the dramatic impact of this event on survivors, no study systematically explored possible post-traumatic stress reactions. According to previous reports on Italian survivors of natural disasters (Dell'Osso et al., 2011; 2013; Carmassi et al., 2013; 2014a), aim of the present study was to explore PTSD prevalence rates, according to either the new DSM-5 or DSM-IV-TR criteria, in a sample of survivors seeking for help in the aftermath of this railway accident. In order to explore possible differences in the performances of DSM-IV-TR versus DSM-5 criteria for PTSD, according to previous studies (Carmassi et al., 2013; 2014a) we examined the symptomatological diagnosis by means of the positive responses to DSM criterion symptoms on a spectrum questionnaire, the Trauma and Loss Spectrum-Self Report (TALS-SR, Dell'Osso et al., 2008; 2009), that included all criterion symptoms. Further, aim of this study was to explore post-traumatic stress spectrum symptomatology in this same sample.

MATERIAL AND METHODS

Study participants

The study sample consisted of 111 subjects, 60 (54.1%) females and 51 (45.9%) males (mean age of 52.9 ± 15.8 years), evaluated 7 to 8 months after the exposure to the explosion of a train containing liquid gas near to the Central Station of Viareggio (Italy). Subjects were enrolled among those spontaneously referring to an outpatients psychiatric service dedicated to those who survived or witnessed the rail crash.

Exclusion criteria were: age below 18 years, inability to understand the assessment procedures or to sign the informed consent. The Ethics Committee of the Azienda USL 12 of Viareggio (Italy) approved all recruitment and assessment procedures. Eligible subjects provided written informed consent after receiving a detailed description of the study and having an opportunity to ask questions.

Symptoms of post-traumatic stress related to the railway accident were self-rated on Impact of Event Scale-Revised (IES, Horowitz et al., 1979). Survivors were also asked to fulfill the Trauma and Loss Spectrum-Self Report (TALS-SR, Dell'Osso et al., 2009) for assessing post-traumatic spectrum symptoms related to this event.

Instruments and assessments

The IES (Horowitz et al., 1979) is a 15-item self-report instrument, developed to assess patients' stress levels referred within the last week, to a specific traumatic event. Its two-factor structure (including an intrusion and an avoidance subscale) is stable over different types of events and it can discriminate between stress reactions at different times after the event. Item Responses are coded on a 0 to 4 point scale which anchors are: 0 = Not at all; 1 = A little bit; 2 = Moderately; 3 = Quite a bit; 4 = Extremely. In the

present paper the total scores and those in its intrusion and avoidance subscales were reported.

The TALS-SR (Dell'Osso et al., 2009) is a questionnaire developed by an Italian-American team of researchers and includes questions exploring a range of loss and/or traumatic events that the subjects may have experienced across the lifespan and the symptoms, behaviors and personal characteristics that might represent manifestations and/or risk factors for the development of a stress response syndrome. Originally developed in English, the interview was then translated into Italian, back translated, and then revised for inconsistencies between the two languages (Dell'Osso et al., 2009). In the present study, we used the final Italian version of the self-report (Dell'Osso et al., 2009). The TALS-SR includes 116 items organized into 9 domains. Item responses are coded in a dichotomous way (yes/no) and domain scores are obtained by counting the number of positive answers. The 9 domains are related to: loss events; grief reactions; traumas; emotional, physical and cognitive responses to loss and/or traumatic events; re-experiencing; avoidance and numbing; maladaptive coping; arousal; and personality traits/risk factors. According to the aims of the present study, we focused our attention on symptoms relative to Domain V (Items 77–85), Domain VI (Items 86–97), Domain VII (Items 98–105) and Domain VIII (Items 106–110). The presence of a symptomatological PTSD diagnosis was determined by means of the TALS-SR items corresponding to both DSM-IV-TR and DSM-5 criteria for PTSD. According to previous studies (Carmassi et al., 2014a; 2013; Dell'Osso et al., 2011; 2013) we adopted the following matching between TALS-SR (Hardoy et al., 2005) items and DSM symptom criteria. In particular, the TALS-SR providing a spectrum approach to PTSD also included symptoms corresponding to those included by the DSM-5 among the core symptoms.

- Criterion B, intrusion (B1 = 80; B2 = 77; B3 = 79; B4 = 78; B5 = 81);

- Criterion C, avoidance and numbing (C1 = 86; C2 = 87 and/or 88 and/or 89; C3 = 90; C4 = 95 C5 = 91; C6 = 93; C7 = 92);

- Criterion D, hyperarousal (D1 = 108; D2 = 106; D3 = 107; D4 = 105; D5 = 109).

For DSM-5 diagnosis, we utilized the following

- Criterion B, intrusion (B1 = 80; B2 = 77; B3 = 79; B4 = 78; B5 = 81);

- Criterion C, avoidance (C1 = 86; C2 = 87 and/or 88 and/or 89);

- Criterion D, negative alterations in cognitions and mood (D1 = 90; D2 = 95; D3 = 85; D4 = 96; D5 = 91; D6 = 93; D7 = 92);

- Criterion E, alterations in arousal and reactivity (E1 = 108; E2 = 99 and/or 100 and/or 102 and/or 103 and/or 104; E3 = 106; E4 = 107; E5 = 105; E6 = 109).

In accordance to the sample characteristics, the criterion A was considered satisfied.

Statistical analyses

IES intrusive symptoms and avoidance symptoms domains scores, IES total score, TALS-SR domains and TALS-SR total score were computed.

The computation of the prevalence of PTSD diagnosis according to both DSM-5 and DSM-IV-TR criteria, including gender differences, was conducted using Chi-Square test for comparison. Cohen's Kappa was computed to verify the consistency between the two diagnostic systems; the overall consistency, being the proportion of subjects either meeting or not meeting both criteria sets at the same time (affected-affected and not affected-not affected), was also

computed.

The rates of endorsement of DSM-5 symptoms and their Pearson's correlation coefficients with DSM-5 symptom clusters and total PTSD symptom score were computed.

Receiver Operating Characteristics (ROC) curves, their Areas Under the Curve (AUC), the sensitivity and specificity were each computed to evaluate the impact of DSM-5 criteria on PTSD diagnosis.

The percentage of subjects who did not satisfy DSM-5 criteria among those diagnosed with PTSD according to DSM-IV-TR was computed.

The percentages of cases satisfying the new symptoms added in the DSM-5 were computed as well as the combinations of those essential to the fulfillment the DSM-5 PTSD diagnosis.

RESULTS

Within the whole sample, 75 patients (35 males and 40 females), mean age (SD) 53.9 (15.2) years old, completed all the assessments. Socio-demographic characteristics of the study sample are reported in Table 1. Subjects enrolled had been exposed not only to the rail crash, but also to a massive gas explosion, with a bomb effect on downtown boroughs. Even if no information was systematically collected on physical injuries, we asked the patients about the moment of the traumatic event: one hundred and two subjects out of 111 (91.9%) witnessed the rail crash, the explosion and the significant damage of the buildings around Central Station. Only 9 (8.1%) subjects were not directly exposed to the explosion or the rail crash. Thirty subjects (27.1%) reported a loss of one or more relatives.

Clinical characteristics (IES and TALS-SR domains and total scores) are reported in Table 2. Among these 75, 38 (50.7%) subjects reported a DSM-5 PTSD symptomatological diagnosis, 27 (67.5%) females and 11 (31.42%) males, with a statistically significant difference between the two genders ($\chi^2=9.717$, $p=.002$). Similarly, 41 (54.7%) subjects fulfilled DSM-IV-TR PTSD symptomatological

diagnosis, 27 (67.5%) females and 14 (40%) males, with a statistically significant difference between the two genders ($\chi^2=5.696$, $p=.017$). A 89.19% overall consistency between DSM-IV-TR and DSM-5 was found in the total sample with a Cohen's Kappa of 0.867. The overall consistency within gender subgroups was: 95%, with a Cohen's Kappa of 0.886, in females, and 91.42%, with a Cohen's Kappa of 0.815, among males.

Looking at the DSM-5 PTSD criteria, the rates of endorsement of each of the DSM-5 symptoms and their correlation with DSM-5 symptom clusters and the total PTSD symptom score are reported in Table 3. Overall, each symptom was more highly correlated with its corresponding symptom cluster than with other symptom clusters. The majority of the symptoms were highly (or moderately to highly) correlated with their respective symptom clusters. Symptoms D3 ("distorted blame of self or others") and E2 ("reckless or self-destructive behavior") only showed moderate to weak item-cluster correlations.

Only one (2.6%) of the 38 respondents who met a DSM-5 PTSD diagnosis, did not satisfy all DSM-IV-TR criteria for PTSD. In this case, the patient did not fulfill DSM-IV-TR criterion C (avoidance and numbing). Conversely, among the 41 respondents who satisfied the DSM-IV-TR PTSD diagnosis, 4 (9.8%) did not fulfill all the new DSM-5 criteria. These subjects did not endorse DSM-5 criterion C (avoidance) (Table 4).

By using ROC curves (Table 5), we also evaluated the impact of criteria B (intrusion), C (avoidance), D (negative alterations in cognitions and mood), and E (alterations in arousal and reactivity) on the diagnosis of DSM-5 PTSD. Sensitivity was 79% for criterion C and close to 95% for B, D and E criteria. Specificity was above 70% for C and D criteria, 50% for the E criterion and only 24.3% for the B criterion. AUC was also calculated, with the lowest value of AUC for criterion B (AUC = 0.731).

DSM-5 brought several changes to the diagnosis of PTSD, including three new symptoms: D3 ("distorted blame of self or others"), D4 ("pervasive negative emotional state") and E2 ("reckless or self-destructive behavior"). Our results show that among the 38 subjects diagnosed with DSM-5 (Carmassi et al., 2014a) PTSD, 1 (2.6%) and 29 (76.3%) endorsed either symptoms D3 or D4 respectively, while 6 (15.8%) endorsed both D3 and D4. Furthermore, 8 (27.6%) endorsed symptom E2. We also assessed the number of cases in which the new symptoms were essential to the fulfillment of the respective criterion, and consequently to the diagnosis of PTSD. D3 and D4 symptoms alone were found to be critical for the diagnosis in 1 (2.6%) and 3 (7.9%) cases respectively. In our sample, E2 was never crucial for PTSD diagnosis.

Table 1.
Demographic characteristics.

	Mean/SD
Age (years)	52.9 (15.7) (range: 21-83)
Female gender	n (%) 60 (54.1)
Single	17 (15.3)
Married	66 (59.5)
Separated/divorced	7 (6.3)
Widowed	8 (7.2)
Partner	7 (6.3)
	n (%)
University degree	12 (10.8)
High school degree	34 (30.6)
Middle school	29 (26.1)
Elementary school	18 (16.2)
Others	17 (15.3)
Student	2 (1.8)
Home keeper	10 (9.0)
Unemployed	5 (4.5)
Employee	38 (34.2)
Manager/Freelance	19 (17.1)
Retired	32 (28.8)
Others	5 (4.5)
	n (%)
Family History for Psychiatric Disorders	15 (44.1)

Table 2.
Impact of Event Scale (IES) and Trauma and Loss Spectrum-Self Report (TALS-SR) domains and total scores.

Impact of Event Scale (IES)	Mean	SD
Intrusive symptoms	17.79	12.41
Avoidance symptoms	15.75	11.66
Total score	33.54	22.38
Trauma and Loss Spectrum-Self Report (TALS-SR)		
Loss events	4.57	1.95
Grief reactions	12.71	6.09
Traumas	4.52	2.98
Emotional, physical and cognitive responses	9.23	4.67
Re-experiencing	4.71	2.56
Avoidance-numbing	5.29	3.45
Maladaptive coping	1.40	1.39
Arousal	3.05	1.63
Personality traits	1.35	1.30
Total score	46.82	19.78

Table 3.
DSM-5 symptom endorsement and item-cluster correlations.

DSM-5 symptoms	Endorsed %(N)	Item-cluster correlations (<i>r</i>)				Item total <i>R</i>
		B	C	D	E	
B1. Intrusive recollections	80.0 (60)	0.776 **	0.405**	0.388**	0.583**	0.673**
B2. Distressing dreams	57.3 (43)	0.711 **	0.316**	0.388**	0.554**	0.629**
B3. Dissociative reactions (e.g., flashbacks)	40.0 (30)	0.672 **	0.372**	0.281*	0.395**	0.524**
B4. Psychological distress at exposure to cues	76.0 (57)	0.575 **	0.305**	0.250*	0.274*	0.427**
B5. Physiological reactivity on exposure to cues	57.3 (43)	0.676 **	0.214	0.273*	0.495**	0.533**
C1. Avoidance of internal reminders	40.0 (30)	0.343**	0.819 **	0.354**	0.365**	0.508**
C2. Avoidance of external reminders	64.0 (48)	0.422**	0.811 **	0.366**	0.494**	0.554**
D1. Inability to recall important aspect of trauma	36.0 (27)	0.179	0.208	0.475 **	0.177	0.348**
D2. Negative expectations about self/others/world	37.3 (28)	0.474**	0.310**	0.652 **	0.473**	0.635**
D3. Distorted blame of self or others	9.3 (7)	0.153	0.216	0.374 **	0.285*	0.339**
D4. Pervasive negative emotional state	68.0 (51)	0.392**	0.432**	0.711 **	0.382**	0.621**
D5. Diminished interest in activities	57.3 (43)	0.264*	0.351**	0.770 **	0.347**	0.581**
D6. Detachment or estrangement	45.3 (34)	0.194	0.191	0.765 **	0.278*	0.507**
D7. Inability to experience positive emotions	57.3 (43)	0.419**	0.282*	0.745 **	0.450**	0.645**
E1. Irritable or aggressive behavior	52.0 (39)	0.405**	0.352**	0.377**	0.733 **	0.599**
E2. Reckless or self-destructive behavior	20.0 (15)	0.093	0.025	0.148	0.370 *	0.219
E3. Hypervigilance	62.7 (47)	0.666**	0.423**	0.548**	0.725 **	0.759**
E4. Exaggerated startle response	68.0 (51)	0.465**	0.432**	0.278*	0.602 **	0.542**
E5. Problems with concentration	66.7 (50)	0.516**	0.358**	0.491**	0.788 **	0.702**
E6. Difficulty falling or staying asleep	69.3 (52)	0.450**	0.253*	0.170	0.651 **	0.482**

Note: Bolded *r* values are inter-criterion item-cluster correlations.

* $p < 0.05$

** $p < 0.01$

Table 4.
DSM-5 criteria endorsement in patients diagnosed according to DSM-IV-TR and DSM-IV-TR criteria endorsement in patients diagnosed according to DSM-5.

DSM-5 C, D and E criteria endorsement (N, %) in DSM-IV-TR PTSD patients			
Endorsed	Not Endorsed	N	%
/	C, D, E	0	0
E	C, D	0	0
D	C, E	0	0
D, E	C	4	9.8
C	D, E	0	0
C, E	D	0	0
C, D	E	0	0
C, D, E	/	37	90.2
Total		41	100

DSM-IV-TR C and D criteria endorsement (N, %) in DSM5 PTSD patients			
Endorsed	Not Endorsed	N	%
/	C, D	0	0
D	C	1	2.6
C	D	0	0
C, D	/	37	97.4
Total		38	100

Overall, the addition of three new criteria (D3, D4 and E2) for PTSD in DSM-5, results to be essential in 4 (10.5%) of the diagnoses (Table 6).

DISCUSSION

The present study reports, for the first time, data on PTSD prevalence rates among survivors of the massive accident of the Viareggio train station of 2009, explored 7 to 8 months after trauma exposure. Further, our results add information on PTSD prevalence and symptoms structure according to new DSM-5 criteria with respect to the former DSM-IV-TR ones. The introduction of the new DSM-5 criteria for PTSD raised the question of whether these changes may account for a different detection of the disorder among patients survived to trauma (Dell'Osso & Dalle Luche, 2015). In this regard, survivors to mass trauma represent an important population.

The two diagnostic algorithms performed similarly in terms of PTSD prevalence rates that were reported to be high as more than

half of the survivors enrolled, 50.4% according to DSM-5 criteria and 54.7% according to DSM-IV-TR ones, reported symptomatological PTSD. These rates are comparable, despite higher, to those reported by some of us, by means of a comparable methodology, in a sample of Italian residents from the town of L'Aquila survived to the 2009 earthquake (Dell'Osso et al., 2011; Carmassi et al., 2013; 2014a,b). Despite scant data are available on PTSD prevalence rates in US or European samples of civilians survived to sudden explosions or fires, our results are in line with previous reports (North et al., 1999; Van Kamp et al., 2006; Trinh et al., 2014; Hafstad et al., 2014; Hoge et al., 2014). Van Kamp et al., (2006) examined 3792 residents, passers-by, and rescue workers, involved in and/or affected by a fireworks storage facility in a residential area in The Netherlands (Enschede, 2000) 2–3 weeks after the explosion. Despite PTSD could not yet be established for the short time frame from exposure, high scores on the intrusion and avoidance scale (IES) revealed serious post-traumatic disturbances that were predictive of the development of PTSD. Of the five subgroups, rates ranging from 40% to 75% of the

Table 5.
AUC, sensitivity and specificity of the B, C, D and E criteria in DSM-5.

	AUC		Sensitivity (%)	Specificity (%)
	Mean	Confidence interval		
B Criterion	0.731	0.617	97.4	24.3
C Criterion	0.874	0.794	79.0	75.7
D Criterion	0.871	0.787	94.8	70.3
E Criterion	0.794	0.689	96.1	50.0

p < .001

Table 6.
New DSM-5 PTSD symptoms frequency of endorsement (N=38) and relative impact on the diagnosis

Symptom	Endorsement in DSM-5 PTSD % (N)	Essential for diagnosis % (N)
D3 only	2.63 (1)	2.63 (1)
D4 only	76.32 (29)	7.89 (3)
Both D3 and D4	15.79 (6)	0 (0)
E2	27.59 (8)	0 (0)
Total		10.53 (4)

residents, passers-by, and resident or from Eschede rescue workers reported strong disaster-related intrusion and avoidance reactions.

Further, our data confirm previous studies comparing DSM-IV-TR versus DSM-5 PTSD prevalence estimates that suggest only modest and inconsistent effects (Calhoun et al., 2013; Elhai et al., 2012; Carmassi et al., 2013; 2014a; Miller et al., 2014). Consistent with literature data, our results also show significantly higher DSM-5, as well as DSM-IV-TR, PTSD females with respect to males, with an approximate 2:1 ratio.

Our results seem to suggest a slightly more restrictive approach of the DSM-5 with respect to the DSM-IV-TR criteria for PTSD, apparently not in line with data from a previous study on earthquake survivors where, adopting the same methodology, some of us reported an increase in DSM-5 with respect to DSM-IV-TR diagnoses (Carmassi et al., 2013). At a deeper evaluation, we noticed a different pattern of endorsement of some of the new DSM-5 criteria that resulted to be determinant for the fulfillment of the diagnostic threshold. In this regard, the DSM-5 criterion E2, investigating reckless or self-destructive behaviors, seem to play a major role. Criterion E2 was in fact endorsed by 27.6% of PTSD survivors in the present sample, but by 36.8% of the young adults of the previous one. Further, the endorsement of this criterion was never found to be essential for the diagnosis in this study sample while it resulted to be crucial in 14.2% of the previous one. In this regard, the present results are consistent with some of the initial DSM-5 studies that included analyses of the patterns of item endorsement and the factor structure of the new instrument (Calhoun et al., 2013; Miller et al., 2014). We may argue a possible role of age in these results. There is evidence in fact, of high rates of reckless/self-destructive behaviors in younger populations corroborating the possibility of an age drive.

A high overall consistency emerged in this sample, close to 90%, as well as a Cohen's K above 0.800 in the total sample and within genders. Exploring the correlations of each DSM-5 symptom criterion with its corresponding cluster, we confirmed previous findings (Carmassi et al., 2013) showing a moderate to weak correlations for symptoms D3 (*distorted blame of self or others*) and E2 (*reckless or self-destructive behavior*) with their respective cluster (criterion D and E). The item E2 ('Reckless or Self-Destructive Behavior'), showed a high DSM-5 item-cluster correlation of 0.370. Even if we did not investigate in a systematic manner the potential implications of such correlations from a clinical standpoint, we believe that the importance of PTSD symptoms as risk factors for suicidal ideation and mortality is crucial, as noted in a recent review on suicide risk among veterans (Pompili et al., 2013). However, this could be an interesting topic to consider in a prospective follow-up.

Among the 41 patients fulfilling a DSM-IV-TR PTSD diagnosis, 4 did not meet all the required criteria according to DSM-5. In

particular, these subjects did not meet DSM-5 criterion C (avoidance), assessing active avoidance. Conversely, only 1 of the 38 subjects fulfilling all DSM-5 criteria did not meet all DSM-IV-TR criteria, in particular criterion C exploring avoidance-numbing symptoms. This confirms our previous findings, with both DSM-IV-TR and DSM-5 C criteria being the most important determinant of diagnosis change between the two diagnostic systems. In particular, DSM-5 criterion C (avoidance), requiring both avoidance and numbing symptoms instead of any combination of such clusters, determined a loss of diagnoses in cases where numbing symptoms allowed DSM-IV-TR diagnosis even without avoidance.

Since PTSD symptoms may appear with a long latency both from the traumatic event and from each other, we investigated how showing one of the four required criteria could predict a PTSD diagnosis. Despite the lack of data on the temporal order in which these symptoms appear, our findings suggest the need for further research, highlighting which early symptoms may alert the clinician of a higher risk of full-blown PTSD development and thus adopting a closer follow up or even a possible early treatment. Criterion B (intrusion) showed the lowest specificity (24.3%) followed by criterion E (alterations in arousal and reactivity, 50.0%), while C (avoidance) and D (negative alterations in cognitions and mood) criteria showed a good specificity (above 70%), suggesting that among all the possible symptoms, the presence of avoidance and/or negative alterations in cognition and mood should alert the clinician more for possible PTSD development. This is also in accordance with previous findings among earthquake survivors (Carmassi et al., 2013).

Interpretation of our results should keep in mind some important limitations of the study. The most important is related to the limited sample size and to the fact that it included subjects who spontaneously referred to an outpatient service dedicated to the Viareggio population exposed to the rail accident. This may impact on the generalizability of our results, since not all subjects similarly affected by the railway accident were assessed. Thus our data shed some light on PTSD diagnostic prevalence only among survivors who sought for treatment. However, we underline the chance we had to report on such human made disaster that exceptionally occurred in Italy. Second, we may argue that most severely avoidant PTSD cases may have not been enrolled because of the nature of their symptoms that prevented them from seeking for treatment. It is also important to recall, in this regard, the fact that different trauma as well a different degree of impact of the trauma (including losses) (Carmassi et al., 2014b; Dell'Osso et al., 2011; Boccia et al., 2015; Craparo et al., 2014) may have a different impact on post-traumatic stress symptomatology and we did not have enough information to discriminate subjects according to this issue. A third limitation is the use of a self-report instrument, instead of clinical judgment, in order to detect PTSD symptoms and even the diagnosis. A self-

report of PTSD symptoms may in fact be considered less accurate. Nevertheless, the use of TALS-SR allowed us to accurately compare the possible DSM-IV-TR and DSM-5 criteria reported by the survivors. Fourth, as already mentioned in our first study (Dell'Osso et al., 2011), the lack of information on the presence of other psychiatric comorbidities that may as well follow trauma exposure (Hardoy et al., 2005). Fifth, the lack of assessment on the functional impairment reported.

CONCLUSIONS

Despite the above-mentioned limitations, this study reports for the first time data on PTSD prevalence in subjects exposed to the devastating railway accident of Viareggio (Italy) of June 2009. Moreover, the present study offers an important glimpse at the empirical performance of the DSM-5 PTSD criteria as compared to the DSM-IV-TR ones, suggesting the need for further studies in epidemiological samples to evaluate the change in prevalence rates of PTSD that may result from the adoption of DSM-5 criteria.

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