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► **To cite this version:**

Alexandra Martalek, Caroline Dubertret, Thomas Fovet, Yann Le Strat, Sarah Tebeka. Distressing memories: A continuum from wellness to PTSD.. *Journal of Affective Disorders Reports*, 2024, *Journal of Affective Disorders Reports*, 363, pp.198-205. 10.1016/j.jad.2024.07.076 . hal-04676350

HAL Id: hal-04676350

<https://hal.univ-lille.fr/hal-04676350v1>

Submitted on 23 Aug 2024

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Research paper

Distressing memories: A continuum from wellness to PTSD

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ARTICLE INFO

Keywords:

Post-traumatic stress disorders
Distressing memories
Continuum
Mood disorders
Substance use disorders

ABSTRACT

Background: Exposure to traumatic events is a frequent source of distress, provoking isolated symptoms such as distressing memories (DM) to full-blown post-traumatic stress disorder (PTSD). We aimed to assess the continuum theory using DM as an isolated symptom, and to examine trauma consequences in a exposed to traumatic events.

Methods: Using data from the National Epidemiologic Study of Alcohol and Related Conditions III, we assessed the prevalence of DM in a trauma exposed sample, and examined their sociodemographic and lifetime psychiatric correlates, comparing three groups: (i) controls (no DM, no PTSD); (ii) participants with isolated DM without PTSD; (iii) participants with PTSD. We estimated the sensitivity and specificity of DM for PTSD diagnosis.

Results: In our sample of 17,505 participants exposed to trauma, 13 % had PTSD and 42 % had DM without PTSD. The sensitivity of DM for the diagnosis of PTSD was 95.14 %, specificity was 51.91 %. Participants with DM and those with PTSD shared the same socio-demographic correlates. Participants with DM reported more lifetime psychiatric disorders (mood disorders - mainly depressive disorders and bipolar type 1 disorder; anxiety disorders - mainly social anxiety disorder, substance use disorders - mainly opioid use disorder and cannabis disorder; eating disorders - mainly binge eating disorder; personality disorders - mainly borderline personality disorder and suicidality) than controls, but less than participants with PTSD.

Conclusion: DM represent an intermediate state between well-being and post-traumatic stress disorder; DM is also associated with other psychiatric disorders. It should be considered as a transdiagnostic psychiatric symptom useful for clinicians in identifying psychiatric vulnerability.

1. Introduction

In the U.S., exposure to traumatic events is estimated from 70.4 % to 89.7 % among adults (Breslau, 2009; Kessler et al., 2017; Kilpatrick et al., 2013). Post-traumatic stress disorder (PTSD) develops in a minority of people who have experienced a traumatizing event as its life time prevalence is estimated to be <10 % (Kessler et al., 2017; Kilpatrick et al., 2013). PTSD diagnosis relies on a categorical approach, based on the presence of a sufficient number of discrete items including exposure to a stressor; intrusive symptoms; avoidance; negative alterations in cognition and mood; and alterations in arousal and reactivity (DSM-5, American Psychiatric Association, 2015). These symptoms must be present for more than one month and induce functional impairment or distress. PTSD is associated with social dysfunction, suicidal ideation

(Panagioti et al., 2017) and suicide attempt (Holliday et al., 2020). Trauma exposure and PTSD are associated with a range of psychiatric disorders, including mood and anxiety disorders, psychotic experiences, substance abuse disorders, somatoform disorders and eating disorders (Auxéméry, 2018; Berry et al., 2013; Brady and Brewerton, 2000; Estey et al., 2021; Kachadourian et al., 2014; Mota et al., 2019).

While no consensus has been reached on the definition of sub-threshold PTSD, the presence of at least one symptom of each criteria from the DSM-5 is usually implied (Franklin et al., 2015). Numerous studies have investigated subthreshold PTSD (Juwariah et al., 2022; McKay et al., 2021). Its prevalence has previously been estimated between 2.63 % (Kim et al., 2020) and 27 % (Talbot, 2006) in the general population; and it is associated with intermediate levels of comorbidity and functional impairment (Mitchell et al., 2012; Talbot, 2006; Zlotnick

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<https://doi.org/10.1016/j.jad.2024.07.076>

Received 8 March 2024; Received in revised form 9 July 2024; Accepted 14 July 2024

Available online 17 July 2024

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et al., 2002). There is ever increasing data characterizing different forms of subthreshold PTSD, which taken together, support arguments for considering PTSD as a continuum (Kim et al., 2020).

Among symptoms of PTSD, distressing memories are characterized by recurrent, involuntary, and intrusive memories of traumatic events. They are considered one of the cardinal symptoms of PTSD, and a key criterion in the DSM-5 (American psychiatric association, 2015). The prevalence of intrusive memories following a traumatic event is as high as 49 % (Massazza et al., 2021). Because exposure to traumatic events and distressing memories are so common, there is a need to better understand their association and their consequences for psychiatric disorders.

The categorical diagnostic system has been challenged by numerous studies which support a continuum based approach in mental health. Several studies have now demonstrated a clinical continuum between well-being and mental illness, particularly in psychosis (Bourgin et al., 2020; Esterberg and Compton, 2009); and in depression (Tebeka et al., 2018, 2021). This dimensional approach complements and extends the more traditional categorical approach to better understand psychiatric disorders. Furthermore, the categorical approach may result in discrimination against patients with psychiatric disorders (Goffman, 1963; van Os, 2010). In contrast, the continuum model is associated to decreased fear and increased empathy, which can help reduce the stigma surrounding individuals diagnosed with “full” psychiatric disorders (Kingdon, 2009; Schomerus et al., 2016). According to the work of Linscott and van Os (Linscott and van Os, 2010) a continuum exists between the general population and a given disorder when: (i) the symptom of interest is more frequent in the general population than the disorder; (ii) the isolated symptom and the disorder share the same correlates. This hypothesis is based on the idea that the distribution and the severity of a symptom in mental health is not discrete but continuous.

Previous literature has examined risk factors for developing PTSD following trauma exposure (Brewin et al., 2000), predictors of exposure to traumatic events (Benjet et al., 2016), as well as PTSD symptom severity (Able and Benedek, 2019; Fonkoue et al., 2020; Guina et al., 2018). The purpose of the current study is to assess the applicability of the continuum theory to PTSD. Focusing on distressing memories is justified for several reasons. First, distressing memories are a common and nonspecific symptom which often occurs following exposure to a traumatic event (Massazza et al., 2021). As such, this symptom serves as a suitable starting point to test the continuum hypothesis and assess its potential psychiatric ramifications. Secondly, by concentrating on a single symptom, we can more accurately assess the relationships between that symptom, sociodemographic factors, and psychiatric disorders (Tebeka et al., 2021).

The first aim of the current study is to assess the prevalence of distressing memories, the second is to test the continuum hypothesis by comparing sociodemographic correlates in a traumatized population in three independent groups: those with (i) no distressing memories and no PTSD considered controls, (ii) distressing memories, but no PTSD, (iii) PTSD. The third aim is to assess the prevalence of lifetime psychiatric disorders in these three groups.

2. Methods

2.1. Sample

Data comes from a sample of 36,309 participants in the U.S. National Epidemiological Study of Alcohol and Related Conditions III (NESARC-III). NESARC-III is a national survey of civilian, non-institutionalized, U.S. residents. Participants were all over age 18 and were included between 2012 and 2013. It is a nationally representative sample (Grant et al., 2015). The response rate was 60.1 %, comparable to the response rate of other current national US surveys (45.8 % for the 2020–2021 National Survey on Drug Use and Health, 52.8 for the 2021 National

Health Interview Survey).

Participants who answered “yes” to the question “Have you ever experienced a stressful or traumatic event personally?” were considered exposed to a traumatic event. These 17,505 participants were included in the current study.

2.2. Measures

2.2.1. Sociodemographic measures

Sociodemographic characteristics included age, sex, educational level, marital status, personal income, race/ethnicity, region of residence, urbanicity and nativity. Age at interview was categorized as (i) 18–29; (ii) 30–44; (iii) 45–64; (iv) 65+. Educational level was categorized as (i) less than high school; (ii) high school; (iii) some college or higher education. Marital status was categorized as (i) married/common-law marriage; (ii) single/never married; (iii) separated/divorced; (iv) widower. Annual personal incomes were categorized as follows: (i) 0–19,999\$; (ii) 20,000–34,999\$; (iii) 35,000–69,999\$; (iv) > 70,000\$. Race/ethnicity was categorized as (i) white; (ii) black; (iii) native American; (iv) Asian; (i) Hispanic. Region of residence was categorized as (i) Northwest; (ii) Midwest; (iii) South; (iv) West. Urbanicity was either urban or rural. Nativity was categorized into U.S. born and foreign born.

2.2.2. Distressing memories

Participants answering “yes” to the question “Do you have distressing memories of the event?” were considered as having distressing memories. Distressing memories were assessed over the lifetime.

In order to come as close as possible to DSM-5 criterion B1, we propose an alternative definition of distressing memories which includes the ‘involuntary’ nature of these memories. Thus, participants who responded positively to the two questions “Do you have distressing memories of the event?” and “Do you keep remembering the event involuntarily?” were included in the “involuntary distressing memories” group used in the sensitivity analysis.

2.2.3. Assessment of psychiatric disorders

Face to face interviews conducted by trained interviewers were performed, using the Alcohol Use Disorder and Associated Disabilities Interview Schedule 5 (AUDADIS-5), a structured assessment used to evaluate lifetime psychiatric disorders, including PTSD, based on the DSM-5 criteria. The AUDADIS-5 has shown good reliability and validity for substance use disorders as well as psychiatric disorders (Hasin et al., 2015).

2.2.4. Assessment of PTSD symptoms

Using the PTSD section of the AUDADIS-5 questionnaire, we assessed other psycho-traumatic symptoms such as intrusive thoughts, avoidance, altered cognitions, hyperarousal and others, in order to better characterize our sample.

2.3. Statistical analysis

We divided our trauma-exposed participants into three independent groups: (i) no distressing memories and no PTSD (trauma-exposed control participants), (ii) distressing memories without PTSD, and (iii) PTSD (with or without distressing memories).

Weighted percentages and means with their standard errors (SE) were estimated using the Taylor series linearization method, an implemented model-based method. The prevalence of distressing memories was described between groups to assess the continuum hypothesis. Sensitivity and specificity of distressing memories were estimated for the diagnosis of PTSD.

Sociodemographic characteristics were analyzed in the three groups. Prevalence of different psychiatric disorders was also examined in the three groups.

We used Wald chi-square to compare prevalence. Multivariate logistic regression models were estimated with simultaneous entry of socio-demographic covariates. Adjusted odds ratios (ORs) with 95 % confidence intervals are presented to reflect association strength and significance. To account for the risk of type I error, we used the Benjamini-Hochberg method.

We also carried out a sensitivity analysis using the “involuntary distressing memories” group.

We used SUDAAN, version 11.01 (Research Triangle Park, NC) to perform our analyses.

3. Results

3.1. Description of the three groups

In the NESARC-III sample, 17,505 participants (48.2 %) reported having experienced a traumatic event. Among them, 9470 (54 %) reported distressing memories. In the entire sample of the trauma-exposed population, 2181 (13 %) had PTSD, 7395 (42 %) had distressing memories without PTSD and 7929 (45 %) had neither distressing memories nor PTSD. The prevalence of distressing memories was 95 % ($n = 2075$) in the PTSD group and 48 % ($n = 7395$) in the non-PTSD group. The sensitivity of distressing memories for the diagnosis of PTSD was 95.14 % and specificity was 51.91 %.

Table 1

Sociodemographic characteristics for participants with distressing memories without post-traumatic stress disorder (PTSD), with PTSD and controls (no distressing memories, no PTSD) among trauma-exposed participants – odds ratio (OR) adjusted for all other sociodemographic characteristics.

	Control participants (no distressing memory, no PTSD)	Participants with distressing memories without PTSD	Participants with PTSD	Participants with distressing memories without PTSD vs controls		Participants with PTSD vs Participants with distressing memories without PTSD		Participants with PTSD vs controls	
	<i>N</i> = 7929 % (SE)	<i>N</i> = 7395 % (SE)	<i>N</i> = 2181 % (SE)	aOR	95 % CI	aOR	95 % CI	aOR	95 % CI
Age									
18-29y	17.62 (0.54)	16.09 (0.53)	23.35 (1.07)	Ref		Ref		Ref	
30-44y	24.30 (0.60)	26.22 (0.59)	30.03 (1.29)	1.27	1.14–1.42	0.94	0.78–1.13	1.17	0.98–1.40
45-64y	38.58 (0.71)	40.43 (0.63)	37.59 (1.42)	1.18	1.04–1.33	0.74	0.63–0.88	0.86	0.72–1.03
65y+	19.50 (0.59)	17.26 (0.61)	9.03 (0.66)	0.96	0.82–1.12	0.40	0.32–0.51	0.37	0.29–0.47
Sex									
Men	58.66 (0.65)	43.29 (0.72)	30.66 (1.35)	Ref		Ref		Ref	
Women	41.34 (0.65)	56.71 (0.72)	69.34 (1.35)	1.77	1.63–1.93	1.55	1.34–1.79	2.82	2.42–3.29
Education level									
Less than high school	10.48 (0.57)	10.82 (0.54)	16.34 (0.80)	Ref		Ref		Ref	
High school	24.80 (0.77)	25.06 (0.77)	26.47 (1.16)	0.99	0.85–1.15	0.72	0.60–0.87	0.69	0.58–0.81
Some college or higher	64.71 (1.01)	64.12 (0.98)	57.19 (1.30)	0.99	0.86–1.14	0.67	0.56–0.81	0.66	0.55–0.77
Marital status									
Married/ Common-law	60.83 (0.73)	57.81 (0.82)	48.04 (1.66)	Ref		Ref		Ref	
Single / never married	19.07 (0.58)	18.48 (0.58)	24.24 (1.23)	1.06	0.94–1.18	1.20	0.99–1.44	1.25	1.04–1.49
Separated / Divorced	14.76 (0.44)	17.42 (0.60)	22.67 (0.98)	1.15	1.04–1.28	1.47	1.25–1.73	1.73	1.49–2.02
Widower	5.35 (0.30)	6.30 (0.28)	5.05 (0.53)	1.14	0.96–1.35	1.18	0.91–1.52	1.30	0.99–1.71
Personal incomes									
0–19,999 \$	38.22 (0.82)	44.34 (0.83)	57.84 (1.37)	Ref		Ref		Ref	
20,000–34,999\$	20.95 (0.60)	19.92 (0.55)	19.53 (1.06)	0.86	0.78–0.95	0.84	0.72–0.98	0.72	0.61–0.84
35,000–69,999\$	25.55 (0.65)	23.63 (0.58)	16.85 (0.97)	0.85	0.77–0.93	0.66	0.55–0.80	0.56	0.47–0.66
>70,000\$	15.28 (0.70)	12.10 (0.58)	5.77 (0.71)	0.77	0.66–0.90	0.52	0.39–0.69	0.40	0.29–0.53
Race/ethnicity									
White	70.53 (0.85)	72.61 (0.86)	68.14 (1.46)	Ref		Ref		Ref	
Black	11.21 (0.63)	10.27 (0.62)	11.90 (1.03)	0.84	0.75–0.93	1.07	0.88–1.30	0.85	0.71–1.02
Native American	1.49 (0.18)	2.29 (0.26)	4.42 (0.68)	1.28	0.91–1.80	1.63	1.09–2.42	2.23	1.50–3.31
Asian	5.08 (0.51)	3.97 (0.37)	2.15 (0.52)	0.77	0.63–0.94	0.82	0.52–1.30	0.58	0.35–0.94
Hispanic	11.69 (0.61)	10.86 (0.64)	13.39 (0.90)	0.87	0.77–0.99	1.27	1.07–1.52	1.11	0.93–1.33
Region of residence									
Northeast	17.07 (0.74)	18.5 (0.71)	17.52 (1.23)	Ref		Ref		Ref	
Midwest	22.08 (0.81)	21.43 (0.82)	20.68 (1.46)	0.88	0.77–1.00	0.95	0.77–1.18	0.79	0.63–0.98
South	37.31 (1.28)	36.16 (1.25)	38.08 (2.03)	0.89	0.79–1.00	1.02	0.85–1.22	0.84	0.69–0.98
West	23.55 (1.13)	24.26 (1.24)	23.73 (1.62)	0.98	0.88–1.09	1.01	0.86–1.20	0.93	0.78–1.10
Urbanicity									
Urban	78.58 (1.71)	77.09 (1.62)	74.58 (2.42)	Ref		Ref		Ref	
Rural	21.42 (1.71)	22.91 (1.62)	25.42 (2.42)	1.06	0.95–1.18	1.13	0.97–1.31	1.21	0.98–1.49
Nativity									
U.S. born	87.38 (0.63)	88.84 (0.47)	93.01 (0.68)	Ref		Ref		Ref	
Foreign born	12.62 (0.63)	11.16 (0.47)	6.99 (0.68)	0.95	0.83–1.08	0.55	0.44–0.69	0.52	0.41–0.66

Abbreviations: SE; Standard Error; aOR, odds ratio adjusted; CI, confidence interval; PTSD, post-traumatic stress disorder. Significant differences are in bold.

3.2. Sociodemographic observations

Participants with distressing memories without PTSD as well as those with PTSD were more likely than controls to be women (41.34 % in controls, 56.71 % in the distressing memories group, 69.34 % in the PTSD group); separated/divorced and less likely to be married. They were also more likely to be in the age range of 30 to 44 years old and less likely to be over 65 years old. With regard to ethnicity, participants with distressing memories without PTSD and those with PTSD were both more likely to be Native American and less likely to be Asian. These results are presented in Table 1.

There were no differences in level of education, race/ethnicity for the White, Black and Hispanic categories, urbanicity, or region of residence.

3.3. Clinical characteristics and association with psychiatric disorders

Among PTSD symptoms, distressing memories were most frequent in the PTSD group with a prevalence of 95 %, but distressing memories were also reported by 45 % of participants of the non-PTSD group. Participants with distressing memories without PTSD were likely to experience more PTSD symptoms (other than distressing memories) than controls, but fewer than participants with PTSD (see Supplementary Table 1). Participants with distressing memories thus represented an intermediate level for all other PTSD symptoms (see Fig. 1). For participants with distressing memories without PTSD, the most prevalent other symptoms were: involuntary memories about the event (85.97 %); getting very upset when reminded of the event (48.92 %); distressing dreams about the event (44.03 %); avoidance of thoughts and feelings related to the event (41.58 %); blame of others causing the

trauma (40.75 %).

Participants with distressing memories without PTSD and those with PTSD also reported mood disorders: 38.60 % and 70.11 % respectively, with depressive disorders being the most prevalent; 25.99 % and 56.10 % respectively reported anxiety disorders, with generalized anxiety disorder being the most prevalent; 54.41 % and 71.54 % respectively reported any substance use disorders (SUD); and 8.52 % and 25.55 % respectively reported a suicide attempt (Fig. 2, Table 2). Participants in both the distressing memories without PTSD group and the group with PTSD were significantly more likely to report all of these clinical features than controls (Table 2).

The association of co-occurring psychiatric disorders in participants with PTSD compared to those with distressing memories without PTSD were OR = 3.31 [2.88–3.81] for any mood disorder with the strongest association with type 1 bipolar disorder; OR = 3.33 [2.91–3.83] for any anxiety disorder with the strongest association with social anxiety disorder; OR = 2.00 [1.75–2.28] for any SUD. Association with previous suicide attempt was OR = 2.90 [2.41–3.47] (Fig. 2, and Table 2).

Our results remained unchanged after statistical correction for multiple testing (using the Benjamini-Hochberg method).

3.4. Sensitivity analysis

Our sensitivity analyses of “involuntary distressing memories” found the same pattern of results (Table 3). Thus, all of the evaluated psychiatric disorders were significantly associated with both involuntary distressing memories without PTSD (with the exception of eating disorders) and with PTSD, as compared with controls.

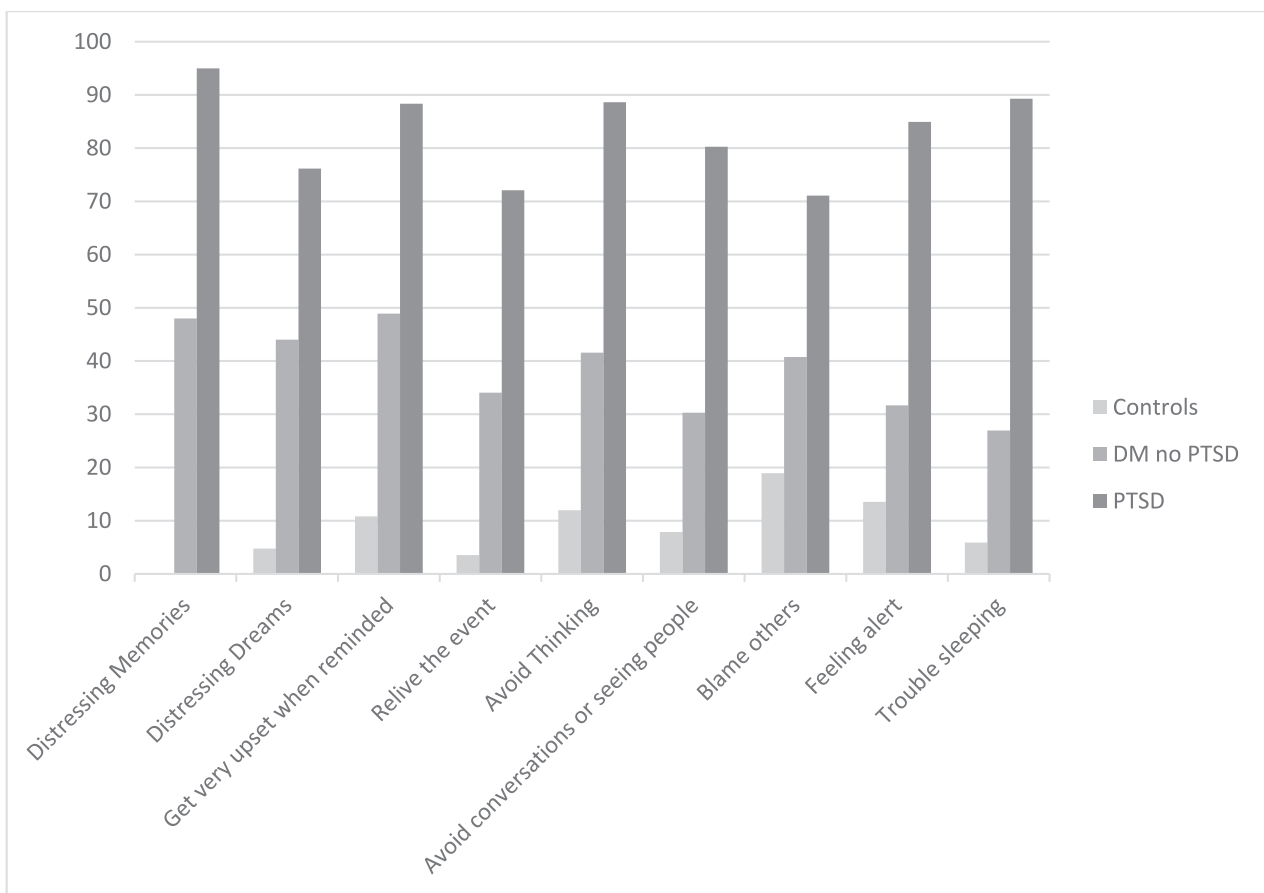


Fig. 1. Prevalence of other post-traumatic stress disorder (PTSD) symptoms among trauma-exposed participants with distressing memories (DM) without PTSD, with PTSD, and controls.

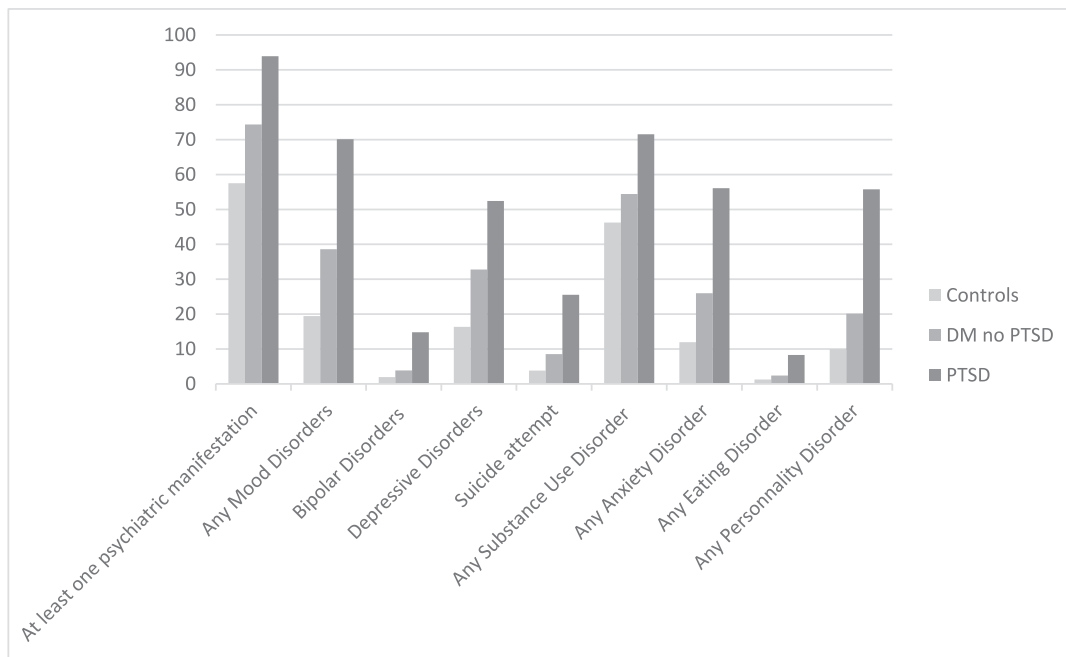


Fig. 2. Prevalence of lifetime psychiatric disorders and suicide attempt among trauma-exposed participants with distressing memories (DM) without post-traumatic stress disorder (PTSD), with PTSD, and controls.

4. Discussion

In this study based on the NESARC-III sample which is representative of the US population, distressing memories were more frequent than PTSD and shared the same sociodemographic correlates. Moreover, distressing memories after trauma exposure were associated with various lifetime psychiatric disorders and corresponded to an intermediate status between no distressing memories and PTSD. In addition, the prevalence of other psychiatric symptoms experienced after trauma-exposure was more elevated in participants with distressing memories than in those without, but less than in participants with PTSD. Altogether, these arguments validate the hypothesis of a continuum between exposure to trauma and the development of PTSD.

In our study, distressing memories were present in 54 % of the sample exposed to a traumatic event, consistent with the prior observation that 49 % of people develop intrusive memories following trauma (Massazza et al., 2021), and in 95 % of the participants with PTSD. The sensitivity of distressing memories for PTSD diagnosis was 95 %, indicating its key role in post-traumatic experiences. However, specificity was relatively low (51 %), highlighting the trans-diagnostic nature of this symptom for other psychiatric disorders.

Distressing memories were more frequent than PTSD in our trauma-exposed population (42 % vs 13 %). Distressing memories are an important component of post-traumatic exposure symptoms and broadly exceed the diagnostic framework of PTSD. Even though distressing memories are not mandatory for diagnosing PTSD, our study confirms their importance in the post-traumatic experience. Our sensitivity analysis, including involuntary distressing memories, reinforces the validity of our results by adding the involuntary nature of distressing memories, thus coming closer to the DSM criteria. Distressing memories were the most frequent symptom in our PTSD group, but also the most frequent in our group without PTSD. Distressing memories need to be better characterized, especially in terms of their associations with other psycho-traumatic symptoms. For example their transdiagnostic nature has been shown in depression (Kuyken and Brewin, 1994) after exposure to sexual abuse.

In our sample, distressing memories were associated with many other psycho-traumatic symptoms. Notably, they co-occurred with

certain classic symptoms of PTSD, but also with “disturbances in self-organization” such as excessive guilt or the feeling that others are to blame. The combination of these symptoms is congruent with the description of complex PTSD, recently proposed in the ICD-11 (World Health Organization, 2018). In addition, dissociative symptoms such as depersonalization and derealization affect more than a quarter of PTSD patients, particularly in cases of complex PTSD (Sommer et al., 2021). These symptoms were not assessed in the present study but they should be the subject of future research, given their association with increased suicide risk. Moreover, participants with distressing memories and those with PTSD shared the same socio-demographic correlates including female gender (Carmassi et al., 2018), being separated or divorced (Benjet et al., 2016) and having low personal income (Al Jowf et al., 2022; Carlson et al., 2016). Although there are some differences in socio-demographic characteristics (such as the level of education), demographic features are largely similar between the two groups, validating the second necessary condition for continuum according to Linscott and van Os (Linscott and van Os, 2010). Thus, our results support the hypothesis of a continuum between exposure to trauma and the development of PTSD in a large and representative sample of the U.S. civilian population. This result is consistent with previous results on subthreshold PTSD (Brancu et al., 2016; Kim et al., 2020).

Distressing memories after trauma exposure are associated with various lifetime psychiatric disorders. This is consistent with previous studies displaying an association of psychiatric comorbidities and sub-threshold PTSD as well as with full blown PTSD (Brancu et al., 2016; Kim et al., 2020; Qassem et al., 2021). Our work also highlights the association between PTSD and other psychiatric disorders, corroborating previous work: a UK study observed that 78.5 % of participants with diagnosed PTSD also had another psychiatric diagnosis, such as depressive disorder, anxiety disorders, substance use disorders and psychotic symptoms (Qassem et al., 2021). Prior studies observed up to 98.8 % comorbid psychiatric disorders in a population of Vietnam veterans (Kulka et al., 1990). Consistent with our results, the most frequent comorbidities of PTSD in the literature are mood disorders, particularly major depressive episodes (Kessler et al., 2005; Qassem et al., 2021), anxiety disorders (Qassem et al., 2021), suicidality (Ferrada-Noli et al., 1998) with suicidal ideation (Panagioti et al., 2017) and suicide attempt

Table 2

Lifetime psychiatric disorders in participants with distressing memories without post-traumatic stress disorder (PTSD), with PTSD and controls (no distressing memories, no PTSD) among trauma-exposed participants – odd ratio (OR) adjusted for all other sociodemographic characteristics.

	Control participants (no distressing memories, no PTSD)	Participants with distressing memories without PTSD	Participants with PTSD	Participants with distressing memories without PTSD vs controls		Participants with PTSD vs Participants with distressing memories without PTSD		Participants with PTSD vs controls	
	% (SE)	% (SE)	% (SE)	OR	95 % CI	OR	95 % CI	OR	95 % CI
At least one psychiatric disorder	57.50 (0.88)	74.35 (0.74)	93.91 (0.70)	2.20	1.99–2.43	4.64	3.58–6.01	10.54	8.16–13.62
Any Mood disorder	19.44 (0.65)	38.60 (0.76)	70.11 (1.21)	2.36	2.13–2.62	3.31	2.88–3.81	7.84	6.85–8.98
Bipolar disorder	1.94 (0.18)	3.86 (0.30)	14.81 (0.93)	2.08	1.65–2.63	3.97	3.13–5.03	8.22	6.41–10.53
Type 1	1.33 (0.17)	2.82 (0.25)	12.83 (0.85)	2.17	1.62–2.91	4.56	3.55–5.87	10.11	7.41–13.79
Type 2	0.61 (0.10)	1.03 (0.13)	1.98 (0.41)	1.82	1.21–2.73	1.85	1.10–3.09	3.11	1.81–5.36
Depressive disorder	16.33 (0.60)	32.76 (0.72)	52.41 (1.38)	2.23	2.01–2.48	2.02	1.77–2.31	4.49	3.91–5.16
Suicide attempt	3.84 (0.28)	8.52 (0.42)	25.55 (1.43)	2.03	1.68–2.46	2.90	2.41–3.47	5.91	4.71–7.40
Any Substance Use disorder	46.24 (0.88)	54.41 (0.73)	71.54 (1.29)	1.50	1.38–1.63	2.00	1.75–2.28	2.93	2.53–3.38
Alcohol use disorder	30.96 (0.81)	37.71 (0.79)	52.49 (1.72)	1.49	1.37–1.62	1.79	1.56–2.06	2.64	2.25–3.10
Tobacco use disorder	29.70 (0.79)	36.91 (0.78)	53.03 (1.26)	1.43	1.31–1.56	1.80	1.58–2.04	2.50	2.20–2.84
Cannabis use disorder	6.46 (0.36)	8.79 (0.52)	18.11 (1.20)	1.52	1.30–1.77	2.11	1.70–2.62	3.11	2.54–3.80
Stimulant use disorder	2.01 (0.23)	2.57 (0.20)	6.02 (0.68)	1.21	0.93–1.57	2.07	1.54–2.78	2.42	1.69–3.49
Opioid use disorder	1.89 (0.21)	2.96 (0.23)	9.18 (0.78)	1.57	1.19–2.07	2.72	2.09–3.53	4.03	2.87–5.66
Any anxiety disorder	11.95 (0.45)	25.99 (0.68)	56.10 (1.47)	2.36	2.10–2.65	3.33	2.91–3.82	7.68	6.68–8.83
Panic disorder	2.93 (0.24)	8.15 (0.44)	25.79 (1.20)	2.56	2.10–3.11	3.33	2.80–3.98	8.27	6.71–10.20
Social anxiety disorder	2.02 (0.21)	5.66 (0.34)	16.91 (1.09)	2.73	2.13–3.50	3.08	2.56–3.69	8.29	6.49–10.60
Generalized anxiety disorder	5.26 (0.32)	12.21 (0.48)	33.38 (1.28)	2.28	1.94–2.69	3.47	3.02–3.98	8.13	6.82–9.68
Any eating disorder	1.24 (0.16)	2.41 (0.18)	8.29 (0.78)	1.61	1.22–2.13	3.20	2.48–4.12	5.13	3.58–7.34
Anorexia nervosa	0.59 (0.12)	1.09 (0.13)	3.56 (0.59)	1.39	0.92–2.09	2.82	1.89–4.20	4.12	2.30–7.38
Bulimia nervosa	0.19 (0.08)	0.26 (0.07)	1.40 (0.38)	1.01	0.38–2.68	3.92	1.80–8.55	4.44	1.61–12.28
Binge eating disorder	0.50 (0.09)	1.12 (0.12)	4.15 (0.49)	2.05	1.37–3.07	3.54	2.57–4.88	6.61	4.27–10.22
Any personality disorder	9.98 (0.45)	20.14 (0.60)	55.76 (1.31)	2.38	2.10–2.71	4.63	4.06–5.29	10.78	9.30–12.49
Schizotypal	2.92 (0.26)	6.76 (0.29)	27.90 (1.34)	2.42	1.96–2.99	4.67	3.96–5.51	11.41	9.31–13.99
Antisocial	2.49 (0.21)	4.54 (0.32)	12.49 (0.86)	2.13	1.70–2.66	2.81	2.33–3.40	5.76	4.57–7.25
Borderline	7.40 (0.40)	16.43 (0.51)	50.60 (1.30)	2.48	2.16–2.85	4.69	4.11–5.34	11.30	9.59–13.31

Abbreviations: SE; Standard Error; OR, odds ratio; CI, confidence interval; PTSD, post-traumatic stress disorder; MDD, Major Depressive Disorder. Significant differences are in bold.

(Holliday et al., 2020), substance use disorders (Blanco et al., 2013; Estey et al., 2021; Kachadourian et al., 2014), and eating disorders (Mason et al., 2017).

The high prevalence of traumatic events, estimated at 70.4 % to 89.7 % in the general population (Breslau, 2009; Kessler et al., 2017; Kilpatrick et al., 2013), makes it necessary to screen for subsequent psychiatric disorders. Distressing memories following trauma exposure are associated with PTSD, but also with other mental disorders and suicide attempts. We found that distressing memories were an intermediate state between controls and participants with PTSD for occurrence of any psychiatric disorders, with an increasing association with mood disorders, suicide attempt, substance use disorder, anxiety disorders, eating disorders and personality disorders when compared with controls. Experiencing distressing memories after exposure to trauma is therefore a marker of psychiatric vulnerability, not specific to PTSD.

Our results may therefore have a direct impact on the daily practice of clinicians: distressing memories may be a marker for a broad spectrum of psychiatric disorders, including PTSD. This may correspond to an “at-risk” general mental state. Thus, screening for distressing memories can help identify vulnerable individuals after a traumatic event in order to offer them appropriate preventive care.

This approach can reduce the stigma associated with mental illness

(Rüsch et al., 2005). The dimensional approach to mental illness erases the dichotomy between “mentally ill” and “normal” (Peter et al., 2021). Most people at some point experience symptoms of psychiatric disorders without meeting the criteria for a specific diagnosis. The deconstruction of a binary view of mental illness could allow for earlier encounters with health professionals for patients, but also for people who do not meet diagnostic criteria but whose quality of life is still impaired by psychiatric symptoms.

There are some limitations to our study. First, the retrospective design of the NESARC makes a memory bias of the traumatic experience unavoidable. Secondly, we did not consider the type of trauma, time and age of exposure or whether the trauma was repeated or continuous. We did not have access to any information about a timeframe for the trauma as the question referred to life-time experience. In addition, the assessment of distressing memories is based on a single question; however, our sensitivity analysis combining the analysis of 2 items (involuntary distressing memories) confirmed our results. Moreover, the question about having experienced stressful and/or traumatic events did not guarantee that our study sample experienced a traumatic event as defined by the DSM-5. Further studies could address these questions, which would further clarify the message and help clinicians. Last, we have used the NESARC criteria for lifetime PTSD, which are more stringent than the

Table 3

Lifetime psychiatric disorders in participants with distressing memories and involuntary remembering without post-traumatic stress disorder (PTSD), with PTSD and controls (no distressing memories, no PTSD) among trauma-exposed participants – odd ratio (OR) adjusted for all other sociodemographic characteristics.

	Participants with involuntary distressing memories without PTSD vs controls		Participants with PTSD vs Participants with involuntary distressing memories without PTSD		Participants with PTSD vs controls	
	OR	95 % CI	OR	95 % CI	OR	95 % CI
At least one psychiatric disorder	1.88	1.61–2.20	4.45	3.42–5.79	8.62	6.65–11.18
Any Mood disorder	2.18	1.86–2.54	3.16	2.72–3.66	6.95	5.83–8.28
Suicide attempt	2.03	1.51–2.74	2.88	2.39–3.46	5.90	4.18–8.32
Any Substance Use disorder	1.28	1.12–1.45	1.96	1.71–2.25	2.44	2.06–2.89
Any anxiety disorder	1.91	1.60–2.29	3.25	2.83–3.75	6.10	5.11–7.28
Any eating disorder	1.45	0.97–2.17	3.15	2.46–4.04	4.36	2.76–6.87
Any personality disorder	1.98	1.67–2.35	4.38	3.83–5.00	8.61	7.13–10.39

Abbreviations: SE; Standard Error; OR, odds ratio; CI, confidence interval; PTSD, post-traumatic stress disorder; MDD, Major Depressive Disorder. Significant differences are in bold.

DSM-5 PTSD criteria (Campbell et al., 2020).

5. Conclusion

This study supported the continuum hypothesis for PTSD by showing that participants exposed to a traumatic event have an intermediate pattern of comorbidities, ranging from trauma exposure without PTSD to full blown PTSD. Our results invite clinicians to look for distressing memories in their patients who have experienced a traumatic event to detect a vulnerability to psychiatric disorders generally, not only to PTSD.

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.jad.2024.07.076>.

Financial support

This research received no specific grant from any funding agency, commercial or not-for-profit sectors.

Ethical standards

The authors assert that all procedures contributing to this work comply with the ethical standards of the relevant national and institutional committees on human experimentation and with the Helsinki Declaration of 1975, as revised in 2008.

CRedit authorship contribution statement

Alexandra Martalek: Writing – original draft. **Caroline Dubertret:** Writing – review & editing, Validation, Methodology, Investigation. **Thomas Fovet:** Writing – review & editing, Validation, Supervision. **Yann Le Strat:** Validation, Methodology, Formal analysis. **Sarah Tebeka:** Writing – review & editing, Writing – original draft, Validation,

Supervision, Methodology, Formal analysis, Conceptualization.

Declaration of competing interest

None.

Data availability

Data sharing not applicable to this article as no datasets were generated or analyzed during the current study.

Acknowledgements

None.

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