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Figures of Speech as a Linguistic Marker of Post-Traumatic Stress Disorder

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Abstract

This study investigates the use of figures of speech by individuals with post-traumatic stress disorder (PTSD), a mental health condition subsequent to a traumatic event. A large body of literature has addressed the issue of trauma-related metaphors, but other figures of speech have not been investigated. Our goal is to analyze these figures of speech in relation to PTSD and to assess the extent to which such linguistic markers can contribute to post-traumatic stress disorder diagnosis. A total of 136 individuals (49.2% with PTSD) among the survivors of the 2015 Paris attacks were interviewed. The different figures of speech they used were analyzed. Our results show that unlike most studies focusing only on metaphors, other figures of speech are also relevant. Second, we found associations between metaphors, similes, and irony and the criterion “avoidance” as well as between the semantic features of metaphors and similes and symptoms. Finally, unlike most studies addressing the use of metaphors for therapeutic purposes, we suggest that figures of speech could be a relevant contributor to post-traumatic stress disorder diagnosis.

Keywords: Post-traumatic stress disorder, language, figures of speech, diagnosis

1. Introduction

1.1 Post-traumatic stress disorder

Post-traumatic stress disorder (henceforth PTSD) is a mental health condition that may occur in individuals who have experienced a traumatic event, either directly or indirectly. According to DSM-5, (American Psychiatric Association), it is characterized by eight criteria: (a) witnessing or experiencing a traumatic event such as death, serious injury, or sexual violence; (b) intrusions such as nightmares or flashbacks; (c) avoidance of stimuli associated with the traumatic event; (d) disturbances in cognition, mood, and emotions; (e) irritability, self-destructive behaviors, hypervigilance, problems with concentration, or sleep disturbance; (f) the duration of the symptoms exceeding one month; (g) the disturbances affecting social functioning; and (h) that they cannot be explained by other reasons such as medication, alcohol consumption, or another medical condition. The diagnosis is based on clinical examination and on scales such as the PTSD Checklist for DSM-5 (PCL-5) (Blevins et al., 2015). However, such tools lack objectivity, and no biological marker associated with PTSD is usable in clinical practice. We claim that language can be used as a more objective indicator of PTSD and help establish a diagnosis. In this study, we will focus only on criterion C, “avoidance.”

A substantial body of literature exploring the narratives produced by PTSD sufferers has investigated the characteristics of their language, which appears to be altered (Alvarez-Conrad, 2001; Bush & MacNamara, 2020; Crespo & Fernandez-Lansac, 2016; Foa et al., 1995; Author, 2022; Papini et al., 2015; O’Kearney & Perrott, 2006, Pennebaker 1993; Qiu, 2023). Trauma narratives produced by patients with PTSD provide a wealthy source of information in clinical practice. Nevertheless, relating extremely emotional events proves difficult to express, either because the emotionally overwhelming facts and feelings are unspeakable or because the language lacks the words to express the event-related emotions and feelings. One possibility for the patients to overcome these difficulties is to use figurative language (Author, 2023; Moreno, 2022; Qiu et al., 2022). Among the different figures of speech or rhetorical tropes, metaphors have received considerable attention both as a feature of traumatic language and as a therapeutic tool.

1.2. Metaphors

Metaphors and rhetorical tropes are pervasive in everyday language (Lakoff & Johnson, 2008). Strictly defined, a metaphor is a figure of speech that compares a “literal” object with a dissimilar “figurative” object for the sake of establishing a connection of similarity (Orange, 2011, p. 200). Metaphors can give us a new understanding of our experience as they involve understanding one domain of experience in terms of a very different domain of experience (Lakoff, 1993). For instance, “love is a roller-coaster” compares one term in the realm of emotions to another term in the realm of fairs. The first term, “love,” is called the target, and the second one, “roller-coaster,” is called the vehicle. Their relationship is based only on a subset of similarities—for instance, “love has its ups and downs.” Typically, the target can be the speaker, or it is abstract and the vehicle is concrete, which facilitates the expression and understanding of the experience conveyed by the metaphor.

1.3. Trauma-related metaphors

Metaphors are a window showing how individuals think, construct analogies, and make connections between ideas to explain abstract ideas or to find indirect but powerful ways of conveying feelings (Cameron & Maslen, 2010; Rossi et al., 2023). They allow to express unspeakable experiences and provide insight into individuals’ idiosyncratic and implicit ways of conceiving their own experience (Cameron & Malsen, 2010; Author, 2023; Lyddon, Clay, & Sparks, 2001; Qiu, 2023). Hence, they have proven to be especially fruitful in mental health research and health care in different disorders such as autism (Olofson et al., 2014), dementia (Johannessen, Möller, Haugen, & Biong, 2014), depression (Charteris-Black, 2012), or substance abuse (Redden, Tracy, & Shafer, 2013).

Metaphorical language in trauma narratives has also received considerable attention because it is argued that metaphors allow the traumatized individual to talk about the traumatic event without physiological arousal and without being retraumatized by the event (Lyddon, Clay, & Sparks, 2001). Previous studies investigated the themes conveyed by the metaphors produced spontaneously in trauma narratives. Based on online videos of veterans, Foley (2015) found that metaphors are used to express how they survived trauma, how they survived PTSD, and their mission as part of their recovery as well as discussed how metaphors can be used as a therapeutic tool. Beck (2017) investigated metaphors produced by women to describe the anniversary of their traumatic childbirth. The findings show eight categories of metaphors such as “lottery,” “sea of sadness,” or “a guilt trip,” and the author discusses how these metaphors provide insight into these mothers’ suffering and how clinical practitioners could use them as a healing tool. Moreno (2022) analyzed metaphors used by oncology patients in written narratives retrieved from a website on leukemia, lymphoma, and

myeloma. Twenty-one themes were identified, among which the war metaphor was the most frequent one.

Qiu (2023) points to two weaknesses in most research on metaphors and trauma: first, they often lack quantitative analysis and focus on the themes expressed by the vehicle of metaphors (ex. Foley, 2014; Rossi et al., 2023; Beck, 2017); and second, most of them lack a psychometrically validated PTSD diagnosis—for instance, because they use data from websites. We can add a third drawback, which is that most studies lack a control group.

Fewer studies adopt a more quantitative approach. Authors (2023) compared the narratives produced by two groups of patients with PTSD (veterans from Afghanistan and survivors from the Paris attacks that took place in 2015) to those of a control group. Their findings show that individuals with PTSD produced significantly more metaphors than controls and that these metaphors allow them to bridge the gap between the unspeakable memories of the event and their expression. Qiu et al. (2023) analyzed the narratives elicited from a semi-structured interview produced by individuals diagnosed with acute stress disorder (ASD) for which diagnosis criteria are the same as those of PTSD except for the duration, which is less than one month (assessed by the Stanford Acute Stress Reaction Questionnaire (SASRQ)). In addition, Qiu et al. (2022) analyzed the narratives of individuals with ASD who had experienced the 2019–2020 Hong Kong social unrest. They found that specific metaphors were associated with dissociation, re-experiencing, avoidance, anxiety, and hyperarousal as well as impairment in functioning. Using the same methodology, Qiu (2023) found that the severity of the trouble yielded an increasing use of metaphors. Furthermore, certain types of metaphors were associated with certain ASD criteria: negative emotion metaphors significantly correlated with intrusive re-experiencing symptoms, self-related metaphors with anxiety and hyperarousal, and physical activity metaphors with impairment in functioning.

1.4. Other figures of speech

Whilst metaphors have received considerable attention in relation to PTSD, other figures of speech that are also part of our everyday language have not. We argue that they can also provide a wealth of insight into the way PTSD sufferers conceptualize and express their experiences. Such tropes are similes (“we were trapped like rats”), metonymies (“I am drinking a glass”), synecdoche (“he asked for her hand in marriage”), irony (“How wonderful—it is raining!”), hyperboles (“I am so hungry, I could eat a horse”), understatements (describing a huge storm: “it looks like it is raining a little bit”), and circumlocutions (“the ones who committed the attack” for “the terrorists”). Circumlocutions are often euphemisms, and in this study, only euphemisms were considered.

Our claim is that figures of speech in general and not only metaphors are linguistic markers of PTSD. As such, they can help establish a PTSD diagnosis and avoidance symptoms.

1.5. Objectives and hypotheses

This study aims to explore the use of figures of speech in trauma narratives produced by individuals with PTSD and to use these linguistic markers as a contribution of PTSD diagnosis in clinical practice. The originality is four-fold: contrary to previous studies, our investigation is not restricted to metaphors but encompasses other frequently used figures of speech. In addition, our approach is quantitative, includes a control group, and seeks to relate the use of different figures of speech to the different DSM-5 criteria. Third, we investigate a unique dataset where the PTSD and non-PTSD participants were exposed to the same event at the same time, which represents a unique opportunity

to control for confounding factors. Finally, unlike most studies on metaphors and trauma, our focus is on diagnosis and not on the use of metaphors in therapy. More precisely, our goal is to determine associations between figures of speech and different PTSD symptoms.

We predict that PTSD sufferers will use more rhetorical tropes in their narratives compared to non-PTSD participants as a means to express the unsayable or to avoid overwhelming emotions. Hence, they should be associated with criterion C, “avoidance.” In line with previous studies, the participants should use more metaphors and similes; more specifically, those metaphors and similes should be more concrete as a means to convey abstract emotional feelings through concrete objects. Since traumatic experience is associated with depersonalization, we expect that the semantic features of similes and metaphors will be “non-human,” more precisely animal and plants. Euphemisms, which are figures used to avoid expressing unpleasant words, should be particularly associated with criterion C in the trauma narratives. Similarly, irony should be used more as a way for PTSD sufferers to distance themselves from the traumatic event and hence should also be related to criterion C.

2. Methods

2.1 Data

On November 13, 2015, three simultaneous terrorist attacks took place in Paris. A concert hall (the Bataclan), nearby cafés and restaurants, and a stadium were targeted. Overall, 130 people died, and 413 were physically wounded. In 2016, several months after the attacks, a large-scale project called “13 Novembre” (“November 13”) was launched (Authors, 2022). The aim was to collect the narratives of 1,000 (934) persons who were affected by the event (“Etude 1,000”). The narratives were elicited by the following instruction: “Can you tell me about November 13, 2015?” and the participants were videotaped. The filmed interview was followed by a shorter structured interview, an emotional memory questionnaire, that included 16 closed and some open-ended questions about post-traumatic symptoms and behaviors according to DSM-5. This study analyzes a subset of the narrative corpus ($n = 136/934$) by including only the participants who met criterion A1 (directly experiencing the traumatic event) or A2 (witnessing or having been threatened at the time of the attacks) of the DSM-5. The participants were recruited voluntarily, through information given by newspapers, the city hall of Paris, and associations of victims. Informed consent was obtained from all the subjects. The “Etude 1,000” component of the program was agreed upon by the “Comité d’Evaluation Ethique Inserm-CNRS (IRB) no. 16321,” which approved all experimental protocols. All the methods were carried out following the EU General Data Protection Regulation (GDPR).

PTSD diagnosis was assessed using the answers from a semi-standardized trauma interview that enabled us to retrieve probable DSM-5 criterion (Authors, 2024). The semi-standardized trauma interview was built by professional psychiatrists, and its metrological qualities were assessed by comparing it with the results of the Structured Clinical Interview for DSM-5 (SCID) from a subsample ($N = 85/934$). The participants were diagnosed with PTSD, PTSD in its partial form if they had been re-experiencing symptoms (criterion B) that caused significant distress and functional impairment (criterion G), and no PTSD. Table 1 provides sociodemographic information about the participants as well as their diagnoses.

Table 1. Participants' sociodemographic data and diagnosis. The p-value of ANOVA and Mann–Whitney U test are also reported. The effect sizes are, respectively, Cramer and eta-squared.

Variable	PTSD	Partial PTSD	No PTSD	p-value	SE	Power
N	69	40	29	–	–	–
%	49.2	29.4	21.3	–	–	–
% Female	55.2	70	55.2	0.27	0.13	0.27
age (year), mean ± STD	36±9	37±10	42±10	0.03*	0.04	0.9
Students (%)	7.5	5.0	0	0.17	0.3	0.5
Retired (%)	0	0	3.4			
Unemployed (%)	10.4	2.5	0			
Employee (%)	4.5	10.0	3.4			
Intermediate profession (%)	19.4	12.5	31.0			
Executive and higher profession (%)	43	55.0	48.3			
Worker (%)	0	2.5	0			
Craftsman and retailer (%)	6.0	7.5	13.8	0.7	0.12	0.15
Master's degree or higher	61.2	50.0	55.2			
Bachelor's degree or equivalent	22.4	32.5	31.4			
High school diploma or less	13.4	17.5	13.8	0.8	0.05	0.08
Single (%)	65.7	65	58.6			
Living alone (%)	26.9	32.5	41.4	0.4	0.12	0.22

The interviews were transcribed using the Vocapia (Speech to Text API | Vocapia) software and then corrected by a human annotator. The corpus consists of 136 interviews and comprises 745,038 words. On average, an interview is 5,309 words long ($\pm 3,437$ words). The participants of this study did not give written consent for their data to be shared publicly, due to the sensitive nature of the research. For this reason, supporting data is not available.

Figures of speech were manually coded by an expert linguist following two criteria: there was a contrast between the intended meaning and the literal meaning; and the different figures of speech were then categorized according to the definitions presented in Section 1. About 20% of the corpus was double-checked, and the degree of agreement was 98%. A total of 1,035 figures of speech were identified. Table 2 presents examples extracted from our corpus for each figure of speech.

Table 2. Figures of speech and their examples.

Figure of speech	Example	Meaning
Metaphor	<i>C'était vraiment une boucherie à l'intérieur, un abattoir</i> It was really a butcher shop inside, a slaughterhouse	There was a lot of blood and dead bodies
Simile	<i>On s'est couchés les uns sur les autres comme un château de cartes ou des dominos qui tombent</i> We lay on top of each other like a falling house of cards or falling dominoes	We were not agentive human beings anymore but rather inanimate objects without volition or control
Metonymy	<i>Il y avait des draps, des draps blancs partout sur le trottoir</i> There were sheets, white sheets everywhere on the pavement	There were corpses everywhere on the pavement
Synecdoche	<i>Je sens un ventre contre moi qui respire vite</i> I feel a belly against me breathing quickly	belly = person
Euphemism (Circumlocution)	<i>je, j'essaie de lui parler et je comprends que c'est fini, ou c'est . . . il y a plus rien dans ses yeux, il y a plus rien qui il y a plus de . . . il y a plus d'expression</i> I try to talk to her, and I understand that it's over, or it's . . . there's nothing left in her eyes, there's no more . . . there's no more expression	She's dead
Irony	<i>En essayant de passer au-dessus de lui, je me rends compte que c'est un corps mou, un corps froid quoi. Je me dis «Oh super!»</i> Trying to get over him, I realize it's a soft body, a cold body; I say to myself, " Oh great! "	It was not great at all
Understatement	<i>Je ne pouvais rien faire, en tout cas je ne pouvais pas me barrer c'était un petit peu compliqué comme situation</i> There was nothing I could do—or, at least, I couldn't get away; the situation was a little complicated	The situation was very complicated
Hyperbole	<i>il y avait une montagne de cadavres</i> There was a mountain of corpses	There were many corpses

Moreover, we characterized the vehicles of metaphors and similes in terms of semantic features, as shown in Figure 1.

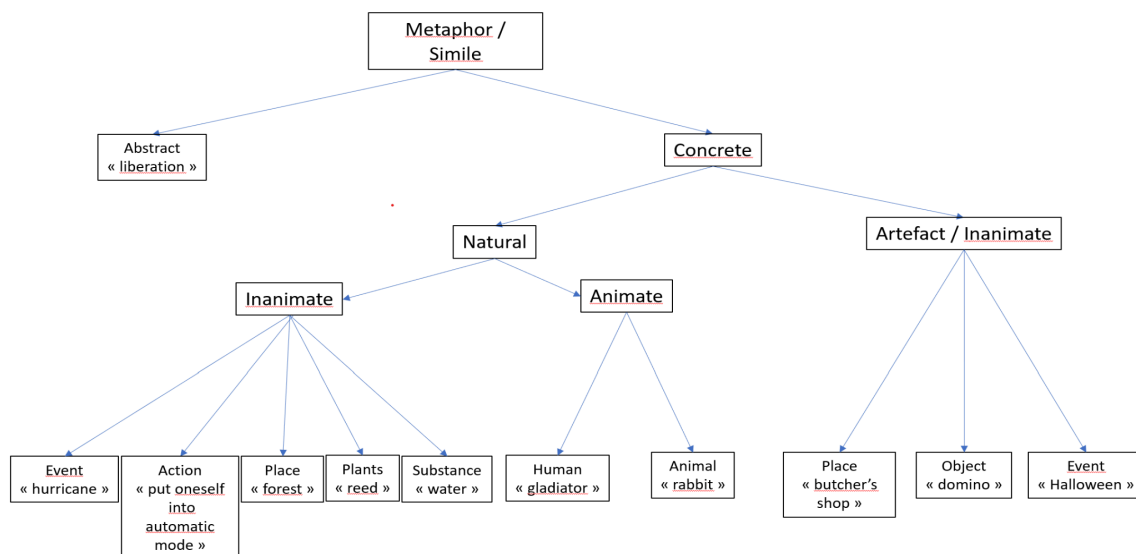


Figure 1. Semantic features of the vehicle for metaphors and similes

In addition, we analyzed the twelve targets of similes and metaphors, as shown in Table 3.

Table 3. Targets of similes and metaphors.

Target	Example
Objects	They put like “blades” on my back, sort of plates
Action	I was trying to get under people—in fact, to dive, so to speak—to try to get under bodies
Weapons	It’s bright, it’s . . . it’s like colored shooting stars
Others (friends)	I was crouched behind George . . . who was a bit like a shield for me
Injuries	Apparently, I had something like a crater in my back
Crowd	People, at least in my memory, were going in circles like chickens
Speaker	I wasn’t crying, I was . . . I was an ice block
Dead	She was a bit like a ballerina, like this
Spatiotemporal elements/event	Here it is, the war is on
Terrorists	They were machines shooting at people
Injured victims	We find a young Dutchman who’s, uh . . . a bit of a mess
Emotions and sensations	I had the sensation of having been through the drum of a washing machine
Police	A sort of modern-day gladiator

2.2 Statistical analysis

Our study employed a rigorous statistical approach to investigate the associations among the figure of speech, PTSD diagnosis, PTSD symptoms, and sociodemographic variables in traumatized populations. First, we rigorously assessed the assumptions of parametric tests, including the normality and homogeneity of variances (e.g., Shapiro–Wilk, Levene’s), to determine the suitability of t-tests for comparing continuous variables across different groups (PTSD vs. non-PTSD). In instances where the assumptions were not met, we utilized the Mann–Whitney U test, a non-parametric alternative, to compare distributions of linguistic features between the PTSD and non-PTSD groups. The p-values were adjusted with the Benjamini–Hochberg procedure to adjust for multiple comparisons, ensuring stringent control over false discovery rates. We used a threshold of significance of 0.05. The Cohen effect size and the statistical power are reported along the p-values. We also computed univariate statistical tests on the groups defined by the presence or absence of symptoms.

To explore the interplay between the use of figurative language and PTSD, we conducted multiple linear regression analyses. These models incorporated sociodemographic variables and specific PTSD symptoms as predictors, enabling a comprehensive understanding of how these factors contribute to variations in the use of figures of speech while controlling for potential confounders. To avoid the increase of predictors, we encoded the sociodemographic information and applied factor analysis of mixed data (FAMD) on social information columns. Then we selected only the components of the FAMD that explained more than 70% of the variance. To ensure the validity of the linear regression, we then computed the variance inflation factor (VIF) for each predictor to quantify the severity of multicollinearity. If the VIF values exceeded 10, we removed these predictors.

3. Results

3.1 Univariate analysis

The distribution did not respect the normal assumption of the t-test; hence, we used the Mann–Whitney U test. This first statistical analysis shows that people in the PTSD group use significantly more figures of speech in their discourse. Particularly, they use more metaphors, similes, and irony (see Table 3, Figure 1). When including the partial diagnosis, we found that people with full or partial PTSD use more synecdoche (val-adj = 4.10^{-2} , EF = -0.4 , P = 0.3) and more irony (p-val-adj = 1.10^{-2} , EF = -0.2 , P = 0.1). Concerning criterion C, it was positively associated with similes (p-val-adj = 4.10^{-2} , EF = -0.4 , P = 0.5), metaphors (p-val-adj = 3.10^{-2} , EF = -0.4 , P = 0.5), and irony (p-val-adj = 3.10^{-2} , EF = -0.3 , P = 0.2).

When digging into the categories of similes and metaphors (see Table 4.1, Figure 3), we found that people with PTSD use concrete figurative speech, focused on natural comparison (both animate and inanimate). Specifically, they use more figures of speech related to humans and locations than non-PTSD individuals. They also mention more animals (“animate-animal”) and substances (“concrete-inanimate-substance,” in most cases “water”) than the non-PTSD group. Still, the statistical power is too low, and we cannot conclude on a strong association. When considering the partial diagnosis, “inanimate” and “location” were associated (p-value = 2.101^{-2} , EF = -0.4 , P = 0.2).

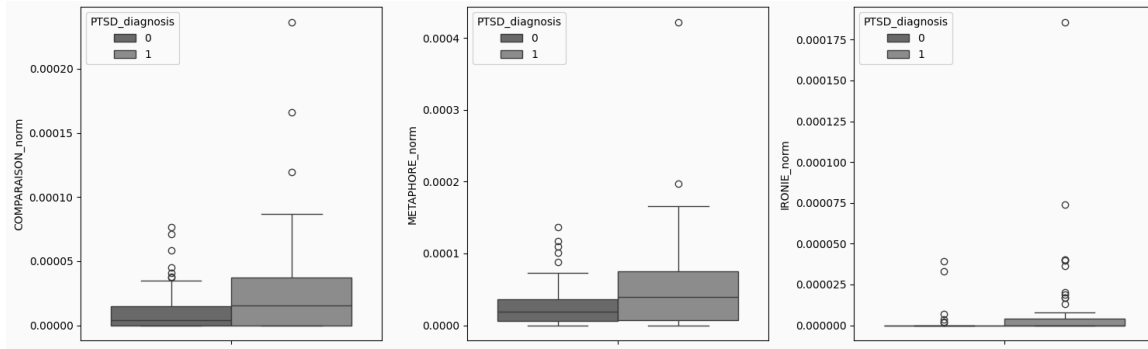


Figure 2. Use of similes (left), metaphors (center), and irony (right) in the PTSD and non-PTSD groups.

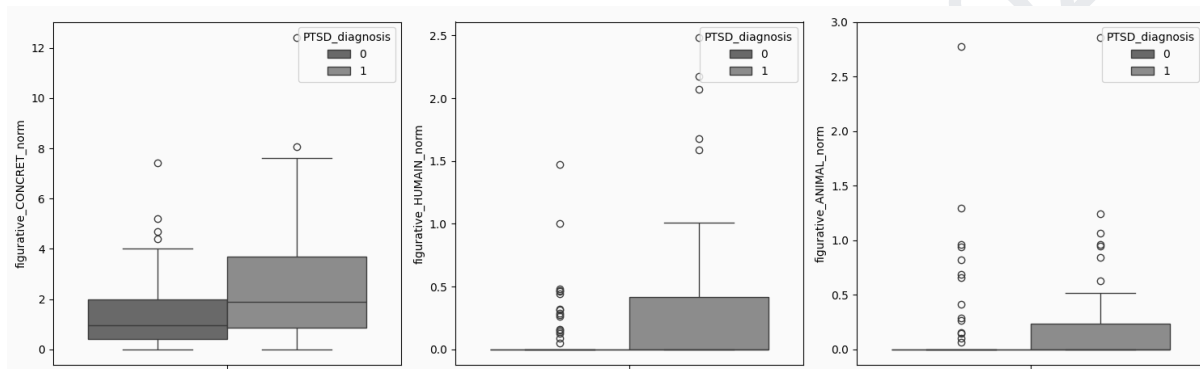


Figure 3. Use of concrete (left), human (center), and animal (right) tropes in the PTSD and non-PTSD groups.

Table 4. Results of Mann–Whitney U statistical test between figures of speech and PTSD diagnosis.

Figure of speech	p-value	Adjusted p-value	SE	Power
Metaphor*	2.10 ⁻²	3.10 ⁻²	-0.48	0.6
Simile*	2.10 ⁻³	3.10 ⁻³	-0.52	0.7
Metaphor + Simile	5.10 ⁻³	1.10 ⁻²	-0.53	0.7
Metonymy	–	–	–	–
Synecdoche	–	–	–	–
Euphemism	–	–	–	–
Irony*	2.10 ⁻³	3.10 ⁻³	-0.37	0.4
Understatement	–	–	–	–
Hyperbole	–	–	–	–

Considering symptom C (avoidance), we found that it is associated with similes and metaphors related to locations, events, and humans.

Table 4.1. Results of Mann–Whitney U statistical test between the categories for similes and metaphors and PTSD diagnosis.

Categories for similes and metaphors	p-value	Adjusted p-value	SE	Power
Concrete*	1.10-3	3.10-3	-0.57	0.7
Abstract	—	—	—	—
Concrete - Natural - Animate*	2.10-3	1.10-2	-0.44	0.5
Concrete - Natural - Inanimate*	2.10-2	4.10-2	-0.51	0.6
Concrete - Artificial	—	—	—	—
Inanimate - Event	—	—	—	—
Inanimate - Action	—	—	—	—
Inanimate - Location*	9.10-3	2.10-2	-0.3	0.2
Inanimate - Plants	—	—	—	—
Inanimate - Substances*	1.10-2	4.10-2	-0.2	0.1
Animate - Human*	7.10-3	4.10-2	-0.50	0.6
Animate - Animal*	3.10-2	5.10-2	-0.15	0.1
Artificial - Object*	4.10-3	4.10-3	-0.5	0.5
Artificial - Events	—	—	—	—

Table 4.2. Results of Mann–Whitney U statistical test between categories for similes and metaphors and criterion C (only the significant results are presented).

Categories for similes and metaphors	p-value	Adjusted p-value	SE	Power
Avoidance Symptoms (CC)				
Animate - Human	1.10-2	2.10-2	-0.5	0.5
Inanimate - Location	4.10-2	4.10-2	-0.4	0.5

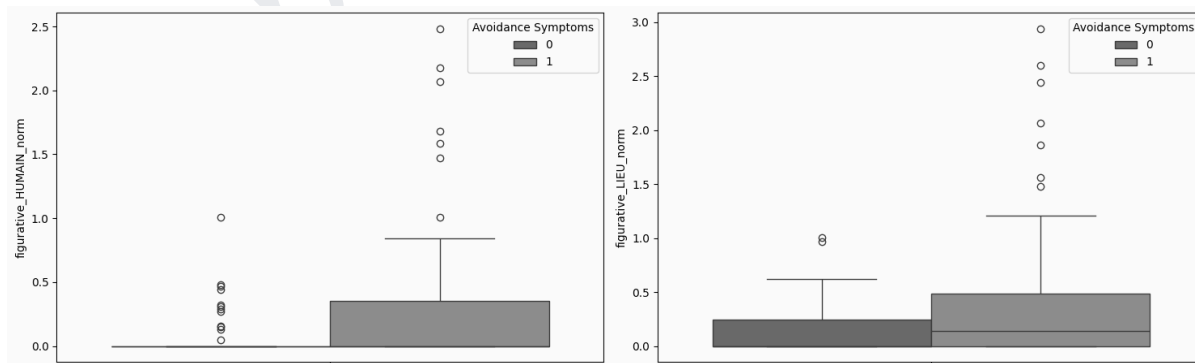


Figure 4. Use of human (left) and location (right) metaphors or similes, depending on avoidance symptoms (C).

The targets of metaphors and similes are also investigated. In Table 4.3, we list all such potential targets and their association with PTSD diagnosis.

Table 4.3. Results of Mann–Whitney U statistical test between targets of similes and metaphors and PTSD diagnosis.

Target for similes and metaphors	N in corpus	p-value	Adjusted p-value	SE	Power
Objects	40	–	–	–	–
Actions	159	–	–	–	–
Weapons	25	–	–	–	–
Others	46	0.01	0.04	–0.4	0.5
Injuries	22	9.10-3	0.03	–0.2	0.1
Crowd	179	0.02	0.04	–0.31	0.2
Speaker	130	–	–	–	–
Dead	30	–	–	–	–
Spatiotemporal elements	253	–	–	–	–
Terrorists	18	3.10-4	7.10-3	–0.5	0.6
Injured victims	7	0.04	0.05	–0.2	0.1
Emotions and sensations	94	–	–	–	–

In Table 4.4, we present the univariate significant association for the partial diagnosis and avoidance symptoms (C).

Table 4.4. Results of Mann–Whitney U statistical test between the targets of similes and metaphors and criterion C (only the significant results are presented).

Categories for similes and metaphors	p-value	Adjusted p-value	SE	Power
Avoidance Symptoms (C)				
Spatiotemporal elements	0.03	0.05	–0.4	0.3
Emotions and sensations	0.03	0.04	–0.4	0.4
Injuries	0.02	0.05	–0.2	0.1
Others	0.04	0.05	–0.4	0.3
Terrorists	2.10-3	0.02	–0.4	0.3

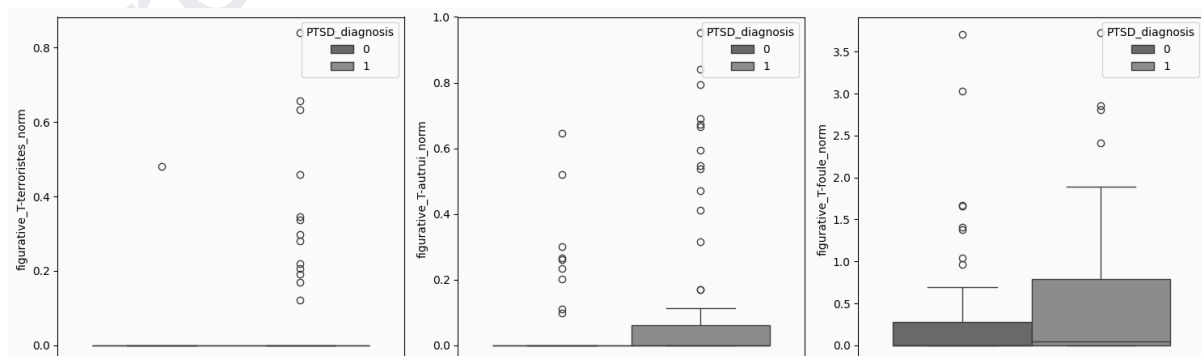


Figure 5. Similes and metaphors targeting terrorists (left), others (center), and the crowd (right) in PTSD and non-PTSD groups.

To complete the previous analysis, we conducted a cross-analysis involving both the vehicles and the targets of the similes, resulting in the creation of approximately 200 new categories, each with a limited occurrence frequency given the limited number of similes in our dataset. To ensure robust statistical significance, we retained only those categories that occurred more than 30 times. Table 4.5 showcases the findings about PTSD diagnosis and Table 4.6 about the sub-symptoms.

Table 4.5. Results of Mann–Whitney U statistical test between the targets × vehicles of similes and metaphors and PTSD diagnosis.

Vehicle for similes and metaphors	Target for similes and metaphors	p-value	Adjusted p-value	SE	Power
Animate - Animal	Crowd	0.03	0.05	−0.2	0.1
Abstract	Spatiotemporal elements	0.03	0.04	−0.3	0.1
Concrete	Others	0.02	0.04	−0.4	0.5
Concrete - Natural - Animate	Crowd	0.02	0.05	−0.2	0.1
Concrete - Artificial	Actions	0.03	0.05	−0.3	0.3
	Speaker	0.01	0.04	−0.3	0.3

Table 4.6. Results of Mann–Whitney U statistical test between the targets × vehicles of similes and metaphors and PTSD symptoms.

Vehicle for similes and Metaphors	Target for similes and Metaphors	p-value	Adjusted p-value	SE	Power
Avoidance Symptoms (CC)					
Concrete	Others	0.05	0.05	−0.4	0.4
Artificial - Events	Spatiotemporal elements	0.05	0.05	−0.3	0.2

3.2 Symptoms analysis and confounding factors control

We applied FAMD on the following columns: profession, age, sex, education, marital status, and living condition (see Table 1). The first three components explained 73.5% of the variance; hence, we only kept those labeled famd_1, famd_2, and famd_3. Table 5 presents the contribution of the columns to each component. Table 6 shows that criterion C is related to the use of the figure of speech. Particularly, figurative language relative to concrete objects is strongly associated with avoidance symptoms (criterion C).

Table 5. Contribution of socio-economic columns to the FAMD component.

	famd_1	famd_2	famd_3
Age	0%	23%	1%
Education	0%	31%	8%
Profession	1%	43%	1%
Living alone	29%	1%	5%
Sex	6%	1%	54%
Single	31%	0%	2%

Table 6. Results of linear regression associated with similes and metaphors related to PTSD diagnosis. The symptom and the sociodemographic information are used as predictors to explain the use of the figure of speech (see Table 5 for FAMD contributions).

Similes and metaphors associated with PTSD diagnosis (used as a predicted variable in linear regression)	PTSD symptoms coef (p-value)				Sociodemographic variable from FAMD coef (p-value)			R ² (adjusted)	F- stats
	B	C	D	G	famd_1	famd_2	famd_3		
Metaphor	-0.2 (>0.1)	0.2 (>0.1)	0.2 (>0.1)	0.2 (>0.1)	-0.1 (0.01)*	0.01 (>0.1)	0.01 (>0.1)	0.13 (0.8)	1.10-2*
Simile	-0.1 (>0.1)	0.1 (0.04)*	0.04 (>0.1)	0.03 (>0.1)	-0.02 (>0.1)	-0.02 (>0.1)	0.01 (>0.1)	0.05 (0.02)	>0.1
Metaphor + Simile	-0.3 (0.2)	0.3 (0.06)	0.2 (>0.1)	0.2 (>0.1)	-0.1 (0.01)*	-0.02 (>0.1)	0.005 (>0.1)	0.12 (0.08)	2.10-2*
Irony	(-0.1)	(-0.1)	(-0.1)	(-0.1)	-0.01 (0.06)	(-0.1)	(-0.1)	0.05 (0.002)	>0.1
Concrete	-1.2 (0.05)*	1.1 (0.007)*	0.3 (>0.1)	0.7 (>0.1)	-0.2 (0.06)	-0.04 (>0.1)	-0.009 (>0.1)	0.14 (0.09)	8.10-3*
Concrete - Natural - Inanimate	-0.9 (>0.1)	0.8 (0.02)*	0.3 (>0.1)	0.5 (>0.1)	-0.2 (>0.1)	-0.01 (>0.1)	0.009 (>0.1)	0.10 (0.06)	5.10-2*
Concrete - Natural - Animate	-0.3 (>0.1)	0.3 (0.03)*	0.15 (>0.1)	0.01 (>0.1)	-0.08 (0.02)*	-0.01 (>0.1)	0.003 (>0.1)	0.12 (>0.1)	3.10-2*
Inanimate - Location	0.03 (>0.1)	0.3 (0.01)*	-0.2 (>0.1)	0.1 (>0.1)	-0.07 (>0.1)	0.02 (>0.1)	0.01 (>0.1)	0.06 (0.01)	>0.1
Inanimate - Substances	0.01 (>0.1)	0.1 (>0.1)	-0.1 (>0.1)	-0.1 (>0.1)	-0.02 (>0.1)	0.02 (>0.1)	-0.01 (>0.1)	0.07 (-0.01)	>0.1
Animate - Animal	-0.4 (0.006)*	0.07 (>0.1)	0.1 (>0.1)	0.1 (>0.1)	-0.02 (>0.1)	0.01 (>0.1)	0.001 (>0.1)	0.08 (0.04)	0.1
Animate - Human	0.05 (>0.1)	0.1 (0.08)	0.07 (>0.1)	-0.03 (>0.1)	-0.07 (0.004)*	-0.01 (>0.1)	0.01 (>0.1)	0.12 (0.7)	2.10-2*
Target Spatiotemporal Clues	-0.1 (>0.1)	0.4 (0.04)	-0.05 (>0.1)	0 (>0.1)	-0.06 (>0.1)	0.03 (>0.1)	-0.03 (>0.1)	0.05 (0.007)	>0.1
Target - Emotions and Sensations	-0.3 (0.003)*	0.15 (0.03)*	0.03 (>0.1)	0.22 (0.01)*	0.01 (>0.1)	0.007 (>0.1)	-0.04 (>0.1)	0.14 (0.09)	8.10-3

4. Discussion

The goal of our study was to investigate the use of different figures of speech in trauma narratives. To conduct this study, we employed a robust statistical methodology based on multiple linear regression analyses to identify associations between the use of figurative language and PTSD on the one hand and with the PTSD symptom C (avoidance) on the other hand. The discussed results are those with a p-value of ≤ 0.05 . As predicted and in line with previous studies, individuals with PTSD used more figures of speech in general, and their figurative language is more concrete as a way to translate abstract ideas and emotions into more understandable and “speakable” words (Lyddon, Clay, & Sparks, 2001; Cameron & Malsen, 2010; Authors, 2023; Qiu, 2023). The originality of our findings is four-fold. First, unlike most studies focusing only on metaphors, we found that other figures of speech are also relevant (see Table 4). Second, we found associations between some figures of speech and criterion C (see Table 4.2) as well as between the semantic features of metaphors and similes and the C symptom, and we analyzed both vehicles and targets (see Tables 4.3 and 4.4). Third, unlike most studies addressing only the use of metaphors for therapeutic purposes, we found that figures of speech are relevant contributors to diagnosis as they are used more frequently by individuals with PTSD. Finally, we considered the influence of cultural and demographic factors on language.

(i) In line with previous studies, we found that individuals with PTSD use more metaphors, but we also found that this result is not restricted to metaphors: in fact, the discourse produced by PTSD sufferers also shows a higher frequency of similes, irony, and synecdoche. The fact that psychologically injured subjects make greater use of figures of speech but in a more concrete rather than abstract sense reflects their difficulty in expressing trauma. Figures of speech are used as an operative tool in the attempt to represent to oneself (and to others) the unthinkable facets of the traumatic scene, which remains an isolated memory from all the representations. When words fail to express what we see and what we feel, the mind constructs a palliative that offers a way of expressing it as anxiety and negative emotions have a deleterious effect on speech planning and execution (Castro & James, 2014). In other words, figures of speech are a way to circumvent this difficulty so as to satisfy representational and communicative needs. They are an intermediary between the traumatic symptom and the burden required to heal it. Metaphors provide a condensed representation of a situation, creating a link between previously irreconcilable objects, converting the original experience through modifications or nuances. Moreover, the PTSD participants used concrete figurative speech, in particular locations, humans, and animals (“animate-animal”). Locations refer to small dark places (e.g., “tunnel,” “cave,” “bottleneck,” “mouse hole”), bloody places (e.g., “battle camp,” “butcher’s shop,” “war scene”), or places evoking death (e.g., “slaughter house,” “Auschwitz,” “concentration camp”). The use of locations could be due to the fact that the main attack took place in a concert hall, which is a closed space, in which the participants were trapped, and paying attention to spatial details was critical to find the exit and flee (Authors, 2022). Human metaphors and similes can be grouped into three categories: powerful humans (e.g., “Bruce Willis,” “a modern-day gladiator,” “warrior”) to refer to the special forces or the police; vulnerable humans (e.g., “grandma,” “child,” “fetus”) to refer to the victims; and humanoids rather than humans per se (e.g., “ghost,” “zombie,” “extra-terrestrial”), also referring to the victims. The animals are mostly small animals (e.g., “rabbit,” “rat,” “caterpillar,” “little mouse,” “pigeon,” “sparrow,” etc.) that are helpless prey “hunted” by the terrorists. Moreover, considering not only the vehicle but also the target, we found that “animate-animal” metaphors were associated with the crowd, while “concrete-artificial” objects were associated with the speaker. These findings suggest the depersonalization and dehumanization felt by the participants. Metaphors could be one of the linguistic markers of traumatic dissociation.

(ii) Metaphors, similes, and irony were associated with cognitive avoidance (of anything reminiscent of the trauma and its consequences, including intrusions). This finding contrasts with that of Qiu et al. (2024), who found no correlations between metaphors and avoidance and dissociative symptoms in ASD. One can hypothesize that the use of figurative speech may vary over time as ASD and PTSD differ in temporality, less than one month for the former and more than one month for the latter. Acute symptoms, which can be very diverse, are more marked by dissociation, sleep disturbances, and anxiety. When a post-traumatic disorder becomes chronic, all symptoms tend to worsen. Figurative language relative to concrete objects was strongly associated with avoidance symptoms (criterion C). Avoidance is a way of protecting the subject against the intrusion symptom, but over time, this mechanism becomes deleterious and locks the subject into traumatic pathology as pathological traumatic memory cannot be integrated into normal autobiographical memory. The use of these figures of speech can be interpreted here as an attempt to overcome verbal avoidance through an intermediary linguistic subterfuge designed to evoke re-experiencing with a lessened intensity. This marker would thus be interesting to use both diagnostically and therapeutically as avoidance markers are rare. However, contrary to our expectations, euphemisms were not associated with criterion C. One possible explanation that needs to be ascertained with complementary studies is that the primary function of euphemism is to attenuate an unpleasant idea (and thus negative cognitions) and not to avoid them. An alternative explanation is that our corpus is not representative of all avoidance behaviors as people were willingly participating in a scientific study where they were asked explicitly not to avoid talking about the traumatic event.

(iii) Most studies about metaphors and PTSD deal with therapeutic applications (Beck, 2017; Foley, 2014; Moreno, 2022). Metaphors have long been used as a tool in different types of therapy (Long et al., 2008; Mathieson et al., 2018; Eichelman, 1985). One way to use metaphors in therapy is to consider the metaphors used by the patients as a window into their cognitions and emotions (Sims, 2003). Paying attention to metaphors can serve different functions, such as building the therapeutic alliance, accessing emotions, or introducing new frames of reference (Cirillo and Crider, 1995; Lyddon et al., 2001; Sims, 2003). Although our findings do not deny the utility of metaphors for therapeutic purposes (e.g., Grove & Panzer, 1989; Kopp & Craw, 1998; Sims, 2003; Sims & Whynot, 1997), our claim is that along with metaphors, other figures of speech are a relevant contribution for diagnosis purposes, which is rarely addressed in the literature on metaphors and PTSD (Qiu, 2023).

(iv) We used a statistical approach to mitigate the main criticisms of psycholinguistic studies (Harrigian et al., 2020; Parola et al., 2023), specifically their perceived lack of generalizability given the strong influence of cultural and demographic factors on language.

Through multivariate regression analysis, we showed that, as expected, social factors contribute significantly to the variance in the use of figurative speech within discourse, with the first factor, FAMD, showing statistical significance in 4 out of the 13 cases examined. However, our models reveal that symptomatic manifestations play a more central role in explaining the prevalence of figurative language (as detailed in Tables 5 and 6). To complement and reinforce the results, we investigated whether certain confounding variables introduced changes to the results. FAMD revealed that the first three components explained 73.5% of the variance. Consequently, only components famd_1, famd_2, and famd_3 were retained. Analysis of the contributions of the various socioeconomic variables to each component (see Table 5) revealed significant associations between certain variables and the FAMD components. For example, living alone showed a strong association with the first component, while gender was strongly related to the second component (see Table 5).

Moreover, avoidance symptoms showed statistical significance in 7 out of the 13 cases presented. This second analysis strengthens the results discussed previously: avoidance symptoms emerge as particularly influential.

Conclusion

PTSD diagnosis relies on psychometric scales as well as on clinical examination based on DSM-5-R criteria (such as PCL-5), but so far, it lacks objective markers usable in clinical practice, which results in the underdiagnosis and undertreatment of PTSD (Danyk et al., 2019). Patients' use of metaphors, similes, irony, and synecdoche as well as words evoking helplessness or dehumanization could be used as red flags by the clinician indicating PTSD, particularly the symptom of avoidance. In addition, they can serve as a means to assess therapeutic progression or to assess the efficiency of psychotherapies. Indeed, figures of speech seem to be a means to bridge the gap between symptoms and the path to recovery. They carry both traumatic symptoms, including those that are clinically difficult to identify, such as avoidance and dissociation. At the same time, those with PTSD try to overcome the irrepresentability of the traumatic scene by seeing and describing it figuratively rather than literally. This is why many therapies use metaphors—to work in this third space co-constructed between the patient and the therapist, where the intensity of the suffering is put at a distance, to begin to rework this suffering toward healing.

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