



Psychological trauma in patients with psychogenic nonepileptic seizures: Trauma characteristics and those who develop PTSD



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ABSTRACT

Objectives: The first objective of this study was to examine and describe the demographic, psychiatric, and trauma characteristics of our sample with PNEs as a whole. Subsequently, a comparison between traumatized and nontraumatized patients with PNEs was performed with regard to descriptive and trauma characteristics and general psychopathology symptoms. Lastly, we analyzed the predictive value in distinguishing patients with “likely” vs. “not likely” PTSD utilizing a model derived from our patients’ psychometric test results.

Methods: We collected and tallied demographic and psychiatric information and trauma characteristics on 61 patients with PNEs who had confirmed or denied having experienced trauma in their lifetime. We then studied this group with the Trauma Symptom Inventory-2 (TSI-2) and the Minnesota Multiphasic Personality Inventory-2RF (MMPI-2RF). Traumatized patients were subsequently classified as “PTSD likely” and “PTSD not likely” based on TSI-2 criteria and compared on demographic, psychiatric, and trauma characteristics and MMPI-2RF scores.

Results: Our study revealed that 45 out of 61 (73.8%) patients reported experiencing at least one traumatic event in their lifetime. Approximately 40% reported physical or sexual abuse followed in percentage size by loss of a significant other, psychological abuse, witnessing the abuse of others, and medical trauma. Traumatized vs. nontraumatized and “PTSD likely” and “PTSD not likely” patients differed significantly on several clinical variables, as well as MMPI-2RF scores. Scores from TSI-2 produced a model that accurately predicted “no PTSD” in 21/26 (80.77%) subjects who denied a history of PTSD and “PTSD” in 5/6 subjects (83.33%) who endorsed a history of PTSD.

Conclusion: This study showed that overall exposure to psychological trauma is much more prevalent in patients with PNEs than in the general population with an inordinately high exposure to sexual and physical abuse as well as a variety of other types of abuse. Psychopathology was identified in the group with PNEs as a whole with discrete distinctions in clinical symptoms and characteristics of the traumatized as well as the “PTSD likely” subgroups. These findings contribute useful information in understanding intragroup differences in what is increasingly appearing to be a heterogeneous psychiatric condition composed of distinguishable subgroups.

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1. Introduction

Exposure to uncontrollable, terrifying, overwhelming life events can produce psychological trauma. Up to 90% of patients with psychogenic nonepileptic seizures (PNEs) have been reported to have histories of significant traumatic experiences with particularly high numbers of childhood (sexual and physical) abuse as compared to control groups and the general population [1,2]. The percentage of patients with PNEs who have been found to exhibit posttraumatic

stress disorder features ranges from 22 to 100% [3]. These numbers differ significantly from reports of lifetime prevalence of posttraumatic stress disorder (PTSD) in the general US population with men at 3.6% and women at 9.7% [4].

According to the DSM-IV [5], a diagnosis of PTSD requires the fulfillment of criterion A (exposure to stressor), criterion B (intrusive recollections), criterion C (avoidant/numbing), and criterion D (hyperarousal), a duration of more than one month, and functional impairment. Research in PTSD is vulnerable to variations in definitions of the disorder and methods used to make the diagnosis. For this study, we employed the Trauma Symptom Inventory-2 (TSI-2) designed to evaluate posttraumatic stress and other psychological sequelae of traumatic events. Although it does not generate DSM-IV diagnoses because this requires further clinical indagation, it does

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evaluate the relative level of various forms of posttraumatic distress and generates measurements for criteria B, C, and D [6].

The purpose of the present study was to examine trauma characteristics in depth within a sample diagnosed with PNEs. The second step was then to compare patients diagnosed with PNEs who reported a history of trauma to a second group of patients with PNEs who denied ever having experienced trauma. Comparisons were made on measures of trauma symptomatology (including anxious hyperarousal, depression, anger, intrusive experiences, defensive avoidance, dissociation, somatic concerns, sexual dysfunctions, and tension reduction behaviors) and general psychopathology. We expected patients with PNEs to evidence an elevated prevalence of trauma as compared to the general population. We also expected patients with a history of trauma to present with posttraumatic symptoms and features, with more general psychopathology and to have a more substantial past psychiatric history. The third step of the study was to identify patients who fulfilled the criteria for likely PTSD and compare them to those who were not suspected to have PTSD. We expected patients with PTSD to present with greater psychopathology and to differ on suspected risk factors for PTSD (i.e., higher tally of trauma incidents, interpersonal trauma vs. impersonal trauma).

2. Material and methods

This study included all consecutive patients with the diagnosis of PNEs ($n = 77$) confirmed with inpatient video-EEG monitoring who went on to complete a comprehensive neuropsychological battery between 2008 and 2012, who had an $IQ > 70$.

All of the subjects were interviewed by a neuropsychologist who elicited a history of trauma. Trauma was classified as physical abuse (e.g., bruising, broken bones, whip marks, stab wounds, concussions resulting from blows to the head), rape/sexual abuse (e.g., touching/fondling and/or forced oral sex or vaginal/anal intercourse), loss or death of significant other (e.g., death of a child, unwanted estrangement, and prolonged shunning from family), severe medical history (multiple and painful surgical interventions or treatments), witnessing the abuse of another (e.g., seeing a sibling or mother being raped or beaten), severe emotional abuse (repeated verbal insults, marginalization and neglect by caretakers, repeated verbal bullying). A tally of types of trauma was recorded. Since some patients had experienced multiple traumatic events, age at the first traumatic episode was classified as “age at initial trauma”. The examiner took note of all psychiatric diagnoses that patients reported receiving in the past, including mood disorders, anxiety disorders, posttraumatic stress disorder (PTSD), obsessive–compulsive disorder (OCD), psychosis, attention-deficit/hyperactivity disorder (ADHD), and learning disability (LD). Occurrences of past suicide attempts and inpatient psychiatric hospitalizations were also noted. Current medications being taken at the time of the assessment were recorded; patients reported whether these were being prescribed to treat depression, anxiety, psychotic symptoms, and sleep disorders. Age at PNEs onset and duration as well as other demographic variables were also logged.

2.1. Exclusion criteria

The final number of patients was reduced to 61 because of the following exclusions: 2 were found to have a dual diagnosis of epilepsy and PNEs, and 14 were classified by the neuropsychologist as putting forth insufficient effort (malingering). Patients were determined to be exerting insufficient effort based on the recommendation stated in the Test of Memory Malingering (TOMM) professional manual combining numerical scores (i.e., Trials 1 and 2 of the TOMM), behavioral observations suggestive of deficient effort, and verification of an active pursuit of a personal injury suit or a disability petition. The following criteria were used to interpret the TOMM scores: 1)

scoring lower than chance on either test trial and 2) scoring below the suggested numerical cutoff on Trial 2 indicate the possibility of malingering.

2.2. Measures

The standard battery of tests administered to our patients with PNEs at the Northeast Regional Epilepsy Group includes ten cognitive tests that assess intelligence, premorbid intelligence, verbal and visual memory, attention, executive functions, speech and language, fine motor skills, and five psychological measures. Because of the substantial load of cognitive testing administered to our patients, the Test of Memory Malingering (TOMM) is part of our battery and serves the purpose of examining the validity of our results. Four psychometric measures from our PNEs neuropsychological battery were used for analysis. The two psychological measures employed are the Trauma Symptom Inventory-2 (TSI-2) and the Minnesota Multiphasic Personality Inventory-2RF (MMPI-2RF). The Test of Memory Malingering (TOMM) and Wechsler Abbreviated Scale of Intelligence (WASI) were utilized as part of the exclusion criteria.

The TSI-2 [6] is a 136-item self-report measure that is used to evaluate acute and chronic posttraumatic symptomatology in adults. The TSI-2 assesses the effects of sexual and physical assault, intimate partner violence, combat, torture, motor vehicle accidents, mass casualty events, medical trauma, traumatic losses, and childhood abuse or neglect. The clinical scales of the instrument measure the extent to which the respondent endorses twelve trauma-related symptoms including the following: anxious arousal, depression, anger, intrusive experiences, defensive avoidance, dissociation, somatic preoccupations, sexual disturbance, suicidality, insecure attachment, impaired self-reference, and tension reduction behavior. The TSI-2 has been thoroughly examined with regard to reliability and validity. Internal consistencies have been reported for all scales ranging from .74 to .94, and test–retest coefficients have been reported for all scales ranging from .76 to .94. The predictive validity of PTSD using the TSI-2 was tested through discriminant function analysis using the T scores for the anxious arousal, intrusive experiences, and defensive avoidance scales. An optimally weighted combination of these TSI-2 scales significantly predicted PTSD with a sensitivity of 1.00 and a specificity of .88. In our study, we utilized the diagnostic TSI-2 standard which is comprised of the anxious arousal (anxiety and autonomic hyperarousal), intrusive experiences (e.g., nightmares, flashbacks, upsetting memories), and defensive avoidance (cognitive and behavioral avoidance of distressing content) scales to assess for PTSD. These scales are in line with criterion B [intrusive recollections], criterion C [avoidant/numbing], and criterion D [hyperarousal] of the DSM-IV. Other scales that were examined included depression, anger (angry or irritable affect, as well as associated angry cognitions and behavior), somatic preoccupations (pain or general health concerns), dissociation, sexual disturbances (unhealthy sexual behavior or unusual concerns), impaired self-reference (identity confusion and lack of identity support), and tension reduction behavior (involvement in distracting external activities as a way to reduce painful internal states including, for example, substance use and sexual acting out). Suicidality and insecure attachment were excluded because they diverged from our study focus. A T score of 65 or higher is considered clinically significant.

The MMPI-2RF [8] is a 338-item self-report measure of psychopathology and personality. The test is comprised of 338 true–false items and is intended for adults (18 and older). There are 51 scales divided into the following 9 categories: validity (9 scales), higher order (HO) (3 scales), restructured clinical (RC) (9 scales), somatic/cognitive (5 scales), internalizing (9 scales), externalizing (4 scales), interpersonal (5 scales), interest (2 scales), and personality psychopathology five (PSY-5) (5 scales). The restructured clinical scales (RCd: demoralization, RC1: somatic complaints, RC2: low positive emotions, and RC3: cynicism) are of special interest given their potential relationship to

PNESs. Consequently, these scales were used for analyses. Higher scores reflect greater psychopathology; a T score of 65 or greater is in the clinical range.

The TOMM [9] is a 50-item visual recognition test that is sensitive to motivation and effort and is specifically designed to differentiate between authentic memory impairments and malingering. The TOMM numerical scores combined with situational variables assist the neuropsychologist in making a clinical decision about the effort that is being put forth on testing. Standardization of this measure was performed on 70 cognitively intact individuals recruited from the community. The mean scores for this sample were 47.8/50 on Trial 1 and 49.9/50 on Trial 2. The percentage of cognitively intact adults who correctly identified 45 or more items on Trial 1 was 90% and 100% at a score of 47 or higher on Trial 2. Scoring 1) lower than chance on any trial and 2) scoring below the suggested numerical cutoff on Trial 2 indicate the possibility of malingering. Patients who were excluded from the present study were determined to be exerting insufficient effort based on the recommendation stated in the Test of Memory Malingering (TOMM) professional manual; this includes 1) a combination of numerical scores (i.e., Trials 1 and 2 of the TOMM), 2) behavioral observations suggestive of deficient effort, and 3) verification of an active pursuit of a personal injury suit or a disability petition. These combined findings raise serious questions about the subject's motivation to perform well on other tests and raise concerns about the validity of all other scores.

The WASI [10] consists of the following four subtests: vocabulary, similarities, block design, and matrix reasoning. The four-subtest form results in verbal (VIQ), performance (PIQ), and full scale (FSIQ) scores. A full scale standard score of less than 70 is below normal limits.

2.3. Analysis

The first step in this study was to examine and describe the demographic, psychiatric, and trauma characteristics of the sample with PNEs as a whole. Subsequently, a comparison between patients with PNEs who reported a history of trauma to those who reported not having experienced trauma was performed. Qualitative demographic and psychiatric characteristics were compared through a chi-square test. Quantitative variables including the scores produced through the patient responses on the TSI-2 and the MMPI-2RF were examined through *t*-test calculations. Lastly, traumatized patients were classified as "PTSD likely" and "PTSD not likely" based on the three most relevant trauma symptom scales; these have shown robust predictive validity in accurately classifying confirmed PTSD (anxious arousal, intrusive experiences, and defensive avoidance). The qualitative variables of these two groups were analyzed through a chi-square test, and the quantitative variables were analyzed through a *t*-test. Subsequently, a regression analysis was performed to determine which significant variables were retained.

Institutional review board approval for an anonymous archival record review was obtained with removal of nonrelevant PHI (Copernicus IRB: NRE1-11-155).

3. Results

Our sample was composed of 8 males and 53 females. Mean age was 37.57 ± 12.049 , and years of education were 13.84 ± 2.382 . Past or present diagnoses reported by the patients included: unipolar depression or bipolar disorder in forty-four patients (72.13%), anxiety disorders in 31 (50.82%), PTSD in 15 (24.59%), ADHD in 7 (11.48%), psychosis in 5 (8.19%), LD in 5 (8.19%), and OCD in 2 (3.27%). Thirteen out of 61 (21.3%) patients had a history of at least one suicide attempt, and 20 (32.79%) had been hospitalized on a psychiatric unit at least once in their lifetime. Forty-two (68.85%) patients had been prescribed some form of psychopharmacological agent which

they were taking at the time of the assessment, 32 (52.46%) were receiving an antidepressant, 23 (37.70%) were taking an anxiolytic, 10 (16.39%) were taking antipsychotic medication, 5 (8.20%) were taking medication for sleep induction, and 21 (34.43%) were receiving some form of antiepileptic medication although it was not always clear whether the prescriber's intent was to treat psychiatric symptoms with these agents. Forty-three (70.49%) patients were or had been in individual psychotherapy, and seven (11.48%) had undergone some form of substance abuse treatment in the past.

Our findings show that overall exposure to psychological trauma was very elevated in patients with PNEs. There was a history of trauma in 45 out of 61 (73.8%) patients; 24 out of 61 reported sexual abuse (39.3%), 25 out of 61 had physical abuse (40.98%), 21 out of 61 had suffered loss/death (34.4%), 15 out of 61 reported psychological abuse (24.6%), 12 out of 61 reported medical trauma (19.7%), and 12 out of 61 reported witnessing abuse (19.7%). A single type of trauma was reported in 15 patients (31.91%), 2 types of trauma were reported in 14 patients (31.11%), and three or more types of trauma were reported by 16 out of 61 patients (26%).

Comparisons between men and women were all nonsignificant, but the very low number of men may have distorted the findings. The mean age at first trauma was 13.89 ± 12.6 . Six out of 8 men (75%) reported a history of trauma, and 39/53 women reported trauma (73.6%). Higher numbers of women reported sexual trauma (men: 1/8, 12.5% versus women: 23/53, 43.4%), physical trauma (men: 2/8, 25% versus women: 23/53, 43.4%), and psychological trauma (men: 1/8, 12.5% versus women: 14/53, 26.42%). A higher yet nonsignificant percentage of men (2/8, 25%) reported witnessing the abuse of others as compared to women (10/53, 17%), and a similar number of men and women reported suffering a major loss of a loved one (men: 2/8, 25% and women: 19/53, 35.8%). One man reported medical trauma (12.5%) compared to 7 women (18.92%).

3.1. Comparison of patients with PNEs with and without a history of trauma

Within the group that had been traumatized, we found that there was considerable mood- and trauma-related psychopathology and somatization.

The 45 patients who reported a history of trauma were significantly more likely to be engaged presently or in the past in individual psychotherapy ($p = .009$, $\chi = 7.46$) and had significantly higher rates of being diagnosed with a mood/bipolar disorder ($p = .005$, $\chi = 8.69$) and PTSD ($p = .04$, $\chi = 3.93$) than nontraumatized patients.

The traumatized vs. nontraumatized groups did not differ significantly on the use of antidepressants, anxiolytics, antipsychotics, or sleep induction or antiepileptic medications. There were also no significant differences with regard to substance abuse treatment, suicide attempts, psychiatric hospitalizations, anxiety, OCD, psychosis, ADHD, or LD. Lastly, no significant differences were found regarding age at time of testing or at the time the diagnosis was made, duration of PNEs, gender, or education.

3.2. Examination of traumatized patients with PNEs with regard to the TSI-2 scales and MMPI-2RF restructured scales

Twelve of the 45 (26.66%) traumatized patients were in the clinically elevated range on the TSI-2 diagnostic standard that includes the three clusters of PTSD-related trauma symptoms (anxious arousal, defensive avoidance, and intrusive experiences). These patients were also in the clinical range on 7 or more of the 12 TSI-2 scales which is strongly suggestive of PTSD as a potential diagnosis. Therefore, the likelihood of a diagnosis of PTSD in this traumatized group falls in the range of 26.66%. Individual scale analyses revealed that the numbers of patients who fell within the clinical range ($T \geq 65$) on the following scales were as follows: 14/47 (29.79%) on dissociation and

impaired self-reference, 16/47 (34.04%) on depression, 20/47 (42.55%) on anxious arousal, 20/47 (42.55%) on intrusive experiences, and 21/47 (44.68%) on defensive avoidance. All other scales revealed clinical ranges at or below 20% of the sample.

A comparison of both groups with regard to the TSI-2 scales revealed significant differences on all of the scales including depression, intrusive experiences, defensive avoidance, somatic concerns, impaired self-reference, tension reduction behaviors, dissociation, anxious arousal, anger, and sexual dysfunction scales (Table 1). Additionally, traumatized vs. nontraumatized groups differed significantly (no: 0.38, \pm 0.18 and yes: 2.29, \pm 0.205, $t = 5.295$ and $p = .001$) on the tally of elevated ($T \geq 65$) TSI-2 scales.

Analyses of the MMPI-2RF reduced the sample size to $n = 34$ including only 6 men. Of the traumatized patients, a clinical range elevation was detected on the RC1 scale (somatic complaints – diffuse physical health complaints) in 27/34 (79.4%) and in 20/34 (58.8%) on the RCd scale. The other two scales that were examined were not statistically significant (RC2—low positive emotion, 18/34, 52.9% and RC3—cynicism, 8/34, 23.5%), with a trend in the opposite direction. A comparison of both groups with regard to the first four restructured scales of the MMPI-2RF revealed that the traumatized group was significantly elevated on RCd; this is the “demoralization scale” characterized by “a pervasive affectively colored set of complaints represented by a persistent failure to cope internally or externally with life” (Table 1).

3.3. Analysis of trauma and PNES characteristics within the group with suspected PTSD

A comparison of the groups classified as “PTSD likely” and “PTSD not likely” based on the TSI-2 scales of anxious arousal, intrusive experiences, and defensive avoidance revealed several significant differences.

Fourteen of the 45 subjects with trauma (31.1%) had been diagnosed with PTSD compared to a very small number of patients without trauma (1/16, 0.63%). It is unclear how this nontraumatized person was diagnosed with PTSD. The group with PTSD had a significantly higher incidence (62.5% vs. 34.1%, $\chi^2 = 4.47$, $p = .05$) of antipsychotic medication use, higher incidence of depression/bipolar psychiatric diagnoses (37.8% vs. 0%, $\chi^2 = 4.39$, $p = .037$), and a higher incidence of suicide attempts (63.6% vs. 36.3%, $\chi^2 = 6.84$, $p = .014$) than the group with no PTSD. The group with PTSD also showed an older age when a PNES diagnosis was made ($t = 2.20$, $p = .033$) and higher scores on the demoralization (RCd, $t = 2.10$, $p = .044$) and depression (RC2, $t = 2.11$, $p = .043$) clinical scales

Table 1
Trauma Symptom Inventory-2 (TSI-2) and MMPI-2RF scores in traumatized and nontraumatized patients with PNESs.

Tests	Trauma: yes	Trauma: no	T value	p value
TSI-2 anxious arousal	63.80 \pm 10.37	55.36 \pm 10.84	−2.633	.011*
TSI-2 depression	59.80 \pm 11.64	50.00 \pm 10.35	−2.819	.007*
TSI-2 anger	55.00 \pm 11.59	48.07 \pm 8.04	−2.079	.042*
TSI-2 intrusive experiences	61.93 \pm 13.15	50.07 \pm 11.45	−3.033	.004*
TSI-2 defensive avoidance	61.60 \pm 10.14	49.79 \pm 10.53	−3.773	.000*
TSI-2 dissociation	63.09 \pm 13.76	53.79 \pm 10.14	−2.335	.023*
TSI-2 somatic concerns	54.68 \pm 12.63	43.75 \pm 3.52	−2.948	.005*
TSI-2 dysfunctional sex behavior	52.24 \pm 13.64	44.71 \pm 2.09	−2.046	.045*
TSI-2 impaired self-reference	58.87 \pm 11.62	48.07 \pm 8.90	−3.190	.002*
TSI-2 tension reduction behaviors	57.64 \pm 14.43	47.29 \pm 6.90	−2.585	.012*
MMPI RCd	65.76 \pm 12.50	55.91 \pm 12.34	−2.280	.028*
MMPI RC1	76.15 \pm 13.61	76.09 \pm 9.10	−.013	.990
MMPI RC2	64.24 \pm 15.86	55.36 \pm 16.40	−1.600	.117
MMPI RC3	55.44 \pm 10.71	49.55 \pm 7.13	−1.701	.096

RCd: demoralization scale, RC1: somatization scale, RC2: depression scale, RC3: cynicism scale. * = significant at $p < 0.05$.

of the MMPI-2RF than the group with no PTSD. Higher tally of trauma events correlated significantly with the “PTSD likely” status ($T = -5.295$, $p = .001$).

A linear regression was performed to predict the presence/absence of PTSD from the psychological and demographic variables. A logistic regression using Wald significance for entry yielded 3 models, with the most significant (Nagelkerke $R^2 = 0.457$) retaining significant beta predictors of RCd (MMPI-2RF, demoralization, Wald = 4.31, $p = .038$) and trends for significance for age at trauma (Wald = 3.54, $p = .06$) and RC3 (MMPI-2RF, cynicism, Wald = 2.86, $p = .09$). The model accurately predicted “no PTSD” in 21/26 (80.77%) subjects without a history of PTSD and “PTSD” in 5/6 subjects (83.33%) with a history of PTSD ($\chi = 12.57$, $p = .006$).

4. Discussion

Taken as a whole, our sample with PNESs contrasted noticeably with the general population with regard to sexual and physical abuse rates. Sexual abuse was reported by 47% of our patients, and 43% reported physical abuse. A sampling of the general population that included 935 adult respondents found that 22.8% fulfilled the criteria for sexual abuse, and 20.86% met the criteria for physical abuse [25]. Uncommonly high numbers of these forms of abuse in samples with PNESs have been reported elsewhere. Fiszman et al. [3] reviewed studies of PNES and found rates of physical or sexual abuse in the range of 23–77%. Out of 45 patients with PNESs, Bowman [39] found that 67% had suffered sexual abuse and physical abuse.

Our trauma type tally revealed that within our sample, 13 patients (27.66%) had experienced two types of trauma, and 16 out of 61 patients (26%) had suffered three or more types of trauma. These rates of more than one trauma type are similar to other studies of trauma in PNESs [14] as well as to rates described in the general population; Briere and Elliot [25] found that 21% of subjects with one type of abuse (sexual or physical) had also experienced the other type.

Although the number of men is small in our sample, we obtained similar differential rates of type of trauma depending on gender as have been reported elsewhere [26]. We also found a much higher rate of sexual abuse in women as compared to men and comparable rates of physical abuse.

As for exposure to general trauma, one of the most common factors reported in PNESs, 45 of our 61 (73.8%) patients reported experiencing some form of trauma in their lifetime. This finding is lower yet comparable to other reported rates of general trauma exposure in PNESs [1,3,21]. Of note, some smaller samples have reported trauma in up to 100% of the patients [27]. Although this elevated number of general trauma occurrences is striking, its significance is uncertain considering that most of the reported rates are not so different from reports of prevalence of trauma in epilepsy control groups or in the general population. A case in point, Rosenberg et al. [27] found that up to 85% of their patients with epilepsy reported trauma. Similarly, a longitudinal general population study conducted by Copeland et al. [28] on children and adolescents revealed that over two-thirds of children reported at least 1 traumatic event by age 16. Even with respect to something as specific as the trauma of suffering a natural disaster, Briere and Elliot found a 22% lifetime self-reported prevalence in their sample of general population participants [29].

Additionally, our sample with PNESs as a whole confirmed previous reports of specific psychiatric characteristics and comorbidities. Unipolar depression or bipolar disorder was noted in 72.13%, and 52.46% were receiving antidepressant agents. This is decidedly higher than the reported prevalence of combined major depression/dysthymia and bipolar disorders in 10.8% of the adult US population [11,12] but consistent with previous studies of PNESs that have revealed a prevalence of affective disorders in substantial numbers [13]. In fact, depression in patients with PNESs has been reported at rates that extend from 21% to 78% [13–18]. Ettinger et al. [19] who

administered a telephone-based structured questionnaire to 56 patients diagnosed with PNEs found that 29 (51.8%) had significant depressive symptoms; suicide attempt rates were reported in 22% and suicidal ideation in 39.3%. The 21.31% of suicide attempts reported by our sample is far higher than the National Comorbidity Survey [20] reports of overall rate of suicide attempts (prevalence: 2.7%) but is similar to the above mentioned study as well as the rate of 25% of suicide attempts reported in another series [16]. It remains unclear if this elevated number of reported suicide attempts in patients with PNEs is an overrepresentation due to the combined tallies of actual suicide attempts and suicidal gestures or may, in fact, signify the severity of the psychopathology observed in this group of patients. Anxiety disorders were present in 50.82% of our sample which is elevated compared to the lifetime prevalence (28.8%) of anxiety disorders in the US [11] but similar to other reports of the prevalence of anxiety disorders in patients with PNEs [17,21–24].

4.1. Comparison of patients with PNEs who were traumatized vs. those who were not

A comparison of patients with and without a history of trauma with regard to the TSI-2 scales revealed significant differences on all ten scales. These findings are consistent with a substantial body of literature on PTSD symptomatology in other traumatized populations [29–32] and in at least one report of traumatized patients diagnosed with PNEs [33].

General trauma research has indicated that there is a connection between trauma, PTSD, and depression. In fact, analysis of lifetime data has shown that preexisting major depression increases the risk for subsequent exposure to traumatic events and the susceptibility to developing PTSD-related factors as well as reports that PTSD increases the risk for major depression [34]. A comparison of both of our groups with regard to the first four restructured scales of the MMPI-2RF revealed that the traumatized group was significantly elevated on the demoralization scale (RCd) which is consistent with a recent study that showed that the demoralization scale was the best individual predictor of PTSD globally [35]. The disparity with Bailles et al.'s [36] report that the depression scale of the MMPI was not found to differ between traumatized and nontraumatized patients with PNEs may be explained by the difference between the MMPI versions. The new MMPI-2RF builds on the foundation of the RC scales, which have been shown to be theoretically more stable and homogeneous than the older clinical scales in which some factors overlapped. Cultural and ethnic differences may also explain some of these discrepancies in that variations in rates of psychopathology have been reported on the MMPI in different ethnicities [36].

4.2. Comparison of patients with “likely PTSD” versus “not likely PTSD”

We found that 26.66% of our traumatized sample fulfilled the criteria for “PTSD likely” as based on the three main scales anxious arousal, defensive avoidance, and intrusive experiences of the TSI-2. This is elevated even within samples that are considered at risk for PTSD (e.g., US military deployed personnel) in which prevalence of PTSD is estimated to be as high as 14–16% [37]. There are, however, reports of marked elevations of PTSD in patients with PNEs. In fact, PTSD prevalence in patients with PNEs has been reported to range somewhere between 33% and 58% and to differ significantly when compared to a sample with epilepsy [38]. We suspect that a possible reason for our lower rates is that the diagnosis of PTSD has been shown to be vulnerable to variations in the 1) definitions of the disorder and diagnostic criteria used to make the diagnosis and 2) chosen measures (Davidson Trauma Scale, PTSD Checklist, Trauma History Questionnaire, Structured Clinical Interview for DSM-III) [14,27, 38]. The main reason that the TSI-2 was selected for our PNEs battery rather than another commonly used trauma measure, the Davidson

Trauma Scale [7], is that the TSI-2 does not ask the respondent to select a “single trauma that was most disturbing” but rather assesses symptomatic responses to combined traumatic events. This seemed to be more appropriate to this population given that they often present with more than one highly disturbing trauma. In addition, the TSI-2 was selected because it is a strong PTSD assessment measure with regard to reliability and validity and produces not only a likely diagnosis of PTSD but also the detection of general PTSD features. There is a strong possibility that differences between our instruments and those of others could have produced differential numbers.

A significant correlation was noted between higher numbers of trauma types and “PTSD likely” status which is consistent with previously reported associations of trauma tallies and the psychological symptomatology of PTSD [29,30]. Exposure to more traumatic incidents has been identified as a risk factor for the development of PTSD. Additionally, greater antipsychotic medication use, a higher incidence of diagnoses of depression/bipolar disorders, and a higher incidence of suicide attempts is indicative of greater psychopathology in this group.

An interesting finding was that patients who qualified for a “PTSD likely” status were significantly older when their PNEs began. The only other study [40] we could identify that looked at older age and trauma as a possible etiological factor differed from ours in that the sample was composed of PNEs onset before 55 years and onset after 55 years. Our sample only included one patient who was over 55 years and is, therefore, not really equivalent.

The “PTSD likely” group exhibited significantly higher scores on the demoralization (RCd) and RC2 with low positive emotion (RC2) clinical scales of the MMPI-2RF. Trauma researchers have described that major depression increases the risk for PTSD among trauma-exposed people more than threefold [34]. Specifically with regard to the demoralization scale, a recent report [35] indicated that this particular MMPI-2RF subscale was the best predictor of global PTSD symptomatology. It has been hypothesized that the association between demoralization and PTSD may support the idea that PTSD can be conceptualized as a “distress disorder” in which a pervasively negative outlook is an essential part of the diagnosis. Within a sample with PNEs, major depression and PTSD were found to be the most common Axis I disorders in Arnold and Privitera's sample of 14 patients [14].

Linear regression of the presence/absence of PTSD obtained through the TSI-2 produced a model that accurately predicted “no PTSD” in 80.77% of subjects without a history of PTSD and “PTSD” in 83.33% of subjects with a history of PTSD. We conclude that the use of this inventory represents a useful addition to the psychometric assessment of patients with PNEs because it provides relevant decision-making information to the clinician indicating that a full psychiatric interview should be conducted to determine whether the patient fulfills criteria for PTSD. Recognizing this diagnosis is important because it modifies the treatment that is implemented. The Treatment Guidelines Task Force established by the Board of Directors of the International Society for the Traumatic Stress Studies determined that the evidence for effective treatment of PTSD is strongest in exposure therapy (in vivo and imaginal) and cognitive processing therapy (CPT). Eye movement desensitization therapy (EMDR) has also been found to be effective in adults [41]. Therefore, if a patient with comorbid PNEs and PTSD is identified, implementation of techniques targeting PTSD symptoms should be considered for inclusion in treatment design.

A limitation of the study is that our sample missed those patients who were diagnosed with PNEs through video-EEG monitoring but did not complete neuropsychological testing because they left our practice after receiving the diagnosis. This group of patients could very well have different characteristics, but it was not possible to examine them. Additionally, the proportion of males in our sample is

less than what has been published in other series which could well represent a limitation. Although our sample produced similar gender trauma characteristics with those reported elsewhere, we cannot be certain that the results on the standard measures were not confounded because of a sampling bias. Moreover, despite using more standardized tools, the fact that we rely solely on patient reports of current symptomatology and psychiatric diagnoses rather than on formal psychiatric assessment could expose results to subjectively colored and hyperbolic historical and symptom reports. Lastly, not collecting information on the ethnic and racial backgrounds of the patients could have led to missing out on important details regarding cultural variations in the specific psychopathology in PNEs.

Future studies should focus on what have been called “resilience factors” to develop explanations as to why only certain traumatized patients go on to develop PTSD along with PNEs. Some resilience factors that have been identified in PTSD research [42] include the following: finding support from others, such as friends, family, and support groups; having been active and effective in the face of the trauma experience; and having a coping strategy or a way of getting through the negative event and learning from it. Additionally, analysis of risk factors of PTSD in patients with PNEs could prove similarly fruitful. Risk factors that have been identified in trauma research include gender, age at trauma, race [43], the severity of the stressor, the age and developmental stage of the person when the trauma occurred, the experience of multiple traumatizations [29], multiple abusers, incest versus sexual abuse by a nonfamily member, and interpersonal versus impersonal trauma [24]. A particularly interesting subgroup that will need to be better understood is the group diagnosed with PNEs that denies any trauma history. The trigger/s of PNEs in those patients remains unclear and introduces the possibility that trauma may not necessarily be etiological. Rather, it may be an aggravating and potentially triggering factor in someone with preexisting psychological vulnerabilities.

Conflict of interest

The authors have nothing to disclose.

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