

Demographic and Seizure Variables, But Not Hypnotizability or Dissociation, Differentiated Psychogenic from Organic Seizures

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ABSTRACT. Early detection and differential diagnosis of psychogenic non-epileptic seizures (PNES) and epileptic seizures (ES) is a major clinical issue in comprehensive epilepsy centers. Using blind conditions with patients with PNES (N = 10) and ES (N = 31) before diagnosis, we tested the hypotheses that individuals with PNES would exhibit significantly greater dissociativity, hypnotizability, absorption, and history of early abuse than ES patients. Although PNES patients tended to show greater dissociative phenomena, only the last of our hypotheses was fully supported. Although absorption did not discriminate between the two diagnostic groups, it was significantly higher among those reporting early abuse. A logistic regression analysis using scores on dissociation, hypnotizability and absorption showed them to be poor predictors of diagnosis; however, other analyses revealed that female gender, reports of multiple trauma incidents lasting months or years, initial seizure onset in late teens or twenties, and daily seizure attacks significantly differentiated PNES from ES patients. Thus, demographic and seizure variables proved to be much better predictors of diagnosis

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than psychological dimensions often associated with PNES. [Article copies available for a fee from The Haworth Document Delivery Service: 1-800-342-9678. E-mail address: <getinfo@haworthpressinc.com> Website: <<http://www.HaworthPress.com>> © 2000 by The Haworth Press, Inc. All rights reserved.]

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Early detection and differential diagnosis of psychogenic non-epileptic seizures (PNES) from epileptic seizures (ES) is a major clinical issue in comprehensive epilepsy centers. PNES involve paroxysmal, involuntary behavior patterns that mimic epileptic events but are unrelated to a neurological or other medical condition. Currently, intensive monitoring of patient behavior by simultaneous EEG tracings and videotape recordings (CCTV/EEG) is the most reliable diagnostic procedure available for a differential diagnosis. PNES patients who lack timely access to intensive monitoring at specialized centers may often go misdiagnosed for extended periods of time as having epilepsy, with numerous detrimental effects. They may be exposed unnecessarily to heavy doses of anti-convulsant medications, and serious medication side effects may include toxicity or possible coma from massive dosage amounts. In rare instances, patients who have both well controlled ES and poorly controlled PNES may even become candidates for brain surgery to control seemingly "intractable epileptic seizures." Additionally, the financial and psychological cost of being incorrectly diagnosed as ES may be high. Moreover, some research has suggested a better prognosis for PNES if the diagnosis is made within six months of onset, especially after the underlying emotional factors or stressors are adequately addressed (Volow, 1986; see also Lempert & Schmidt, 1990; Wyllie, Friedman, Lüders, Morris, Rothner, & Turnbull, 1991), although not every study has corroborated these findings (e.g., Meierkord, Will, Fish, & Shorvon, 1991). These considerations underscore the need for simple and reliable assessment alternatives, in addition to intensive monitoring, for the early detection of and treatment referral for PNES.

When no other medical condition is found, seizure-like behavior recorded during an unambiguously normal EEG typically suggests PNES (Scott, 1982), but a normal EEG does not rule out a possible diagnosis of epileptic seizures. For instance, diagnostic uncertainty may occur when patients exhibit a pattern of subclinical epileptic discharges (Lesser, 1985; Wyler, Richey, & Hermann, 1989). Complicating matters is the fact that some patients will present with both PNES and ES during an evaluation period. Measuring baseline levels of blood serum prolactin is useful for identifying tonic clonic seizures, but less so in other forms of seizures; thus, a negative outcome is

inconclusive (Gates & Rowan, 2000; Wroe, Henley, John, & Richens, 1989). A definitive diagnosis is very complex, especially considering the high variability of both PNES and ES, the difficult differentiation of PNES, especially from frontal lobe epileptic seizures, and the possible comorbidity of PNES and ES (Kuyk, Leijten, Meinard, Spinhoven, & Van Dyck, 1997). Martin and Gates (2000) have provided a decision tree for an alternative and comprehensive classification and differential diagnosis of seizures of various types (pp. 258-259).

Intensive CCTV/EEG monitoring is only available in specialized regional epilepsy centers across the country, typically after referral from the patient's local neurologist or attending physician has been unable to successfully treat a seizure patient on anti-convulsant medications. Various heuristics have been proposed for the differential diagnosis of PNES from ES. For instance, Gates, Ramani, Whalen, and Loewenson (1985) used a combination of behaviors (e.g., upper and lower-extremity movements, pelvic thrusts, and vocalizations at different stages of a seizure) to attain 96% diagnostic accuracy, and Lesser (1985) provided general descriptive features purported to differentiate PNES from ES, although without statistical analyses to evaluate their accuracy. More recently, Walczak and Bogolioubov (1996) reported that ictal weeping, when it occurs, is characteristic only of PNES. Nonetheless, these and other proposed heuristics have various limitations (Gates & Rowan, 2000, Kuyk et al., 1997).

We decided to investigate how a combination of variables related to PNES would function as joint predictors. Following is a brief review of the literature on the psychological (i.e., hypnotizability, general and dissociative psychopathology, and absorption) and demographic (i.e., sex, age, seizure history, history of trauma) variables that we analyzed in this study.

HYPNOTIZABILITY

The idea that suggestibility is a trademark of PNES can be traced back at least to Charcot and his disciple Pierre Janet. The latter wrote that "A tendency to suggestion and subconscious acts is the sign of mental disease, but it is, above all, the sign of hysteria" (Janet, 1907/1965, p. 289), although it is no longer held that high hypnotizability occurs only among mentally impaired individuals. In a similar vein, David Oakley (1999) has reviewed the contemporary empirical literature and proposed that similar mechanisms underlie hypnotic and conversion phenomena, and that PNES and other conversion phenomena should be considered "auto-suggestive" disorders.

The recent literature has typically implied that conversion patients in general are highly hypnotizable, although few systematic studies have been conducted. Hoogduin and Van Dyck (1992) reported on seven paralysis conver-

sion patients, who showed above average hypnotizability. Peterson, Sumner, and Jones (1950/51), with earlier and less developed differential diagnostic tools, reported that PNES individuals had above average hypnotizability. Gross (1983), in a non-random, pre-selected group of PNES patients, reported similar results. Kuyk et al. (1995) found that PNES patients were significantly more hypnotizable than ES ones, a finding they replicated in a later study with a larger sample ($M = 3.15$ for PNES, 1.94 for ES; Kuyk, Spinhoven, & Van Dyck, 1999). They also stated that almost all PNES patients, when given hypnotic suggestions to that effect, could recall what had transpired during a PNES, in sharp contrast with epileptic individuals (diagnostic sensitivity = 85%, specificity = 100%). Similarly, Barry and Atzmon (2000) mentioned the high hypnotizability of PNES, and the use of hypnosis as a diagnostic tool to induce a PNES through suggestions.

GENERAL PSYCHOPATHOLOGY

PNES patients have usually been found to have clinical impairment in addition to their presenting problem. Wilkus, Dodrill, and Thompson (1984) found that these patients did not differ from ES ones in intelligence, neuropsychological impairment, or incidence of potential etiological factors, but had elevated Hy and Hs scales in the MMPI, which provided an 80-90% accurate classification. However, such diagnostic accuracy has not been replicated by other authors (see Kuyk et al., 1997). Binder, Kindermann, Heaton, and Salinsky (1998) reported that both PNES and ES patients showed significant neuropsychological impairment, in contrast with a normal, comparison group. Although there were no significant differences between the seizure groups, the authors concluded that in the case of PNES the impairment had been caused by emotional rather than neurological factors. Using the Portland Digital Recognition Tests and the MMPI II, they were able to accurately diagnose 82% of patients.

With regard to psychiatric conditions alone, panic disorder was present in 70% of a PNES sample (Snyder, Rosenbaum, Rowan, & Strain, 1994). Arnold and Privitera (1996) found that 43% of PNES individuals had other Axis pathology (30% in ES, a non-significant difference; but with trends in the PNES group toward greater major depression, PTSD, alcohol dependence, panic disorder, and borderline personality disorder). Another study concluded that PNES were marginally related to greater anxiety and depression and, of especial interest to this issue, considerably greater somatization and stress-related diseases such as hypertension (Tojek, Lumley, Barkley, Mahr, & Thomas, 2000).

PNES are associated with considerable dysfunction in everyday life. At a follow-up after about two years, 56% of individuals so afflicted reported poor

or very poor physical, mental and social well-being, with the outcome being worse for those who had a long history of seizures and concomitant psychiatric pathology (Lempert & Schmidt, 1990). In another study, Breier et al. (1998) found that PNES patients reported a general low level of quality of life and experienced more physical limitations than chronic complex partial seizure patients.

DISSOCIATION AND ABSORPTION

PNES have been historically considered dissociative conditions, related to other forms of failures to integrate psychological processes (Cardeña, 1994). However, the third (American Psychiatric Association, 1980) and later editions of the Diagnostic and Statistical Manual (DSM) placed them and other types of “conversion” within the somatoform disorders section. This DSM taxonomic change has been criticized on various grounds (Cardeña & Spiegel, 1996; Kihlstrom, 1994; Nemiah, 1991), and clashes with the International Classification of Diseases nosology (ICD; World Health Organization, 1992). Kuyk, Van Dyck, and Spinhoven (1996) recently provided a rationale for considering PNES as a dissociative condition, based on Janet’s observations and theories, the relationship between dissociative pathology and trauma (the majority of PNES patients report a trauma history), and the high hypnotizability and dissociativity of these patients (e.g., Kuyk et al., 1995).

Probably the first comprehensive study of dissociative symptoms and disorders in PNES patients was that of Bowman (1993), who reported that in her sample of 27 outpatients, 85% had some current affective disorder, 85% had some form of dissociative disorder, and 33% had PTSD. The most common forms of dissociation were identity alteration (85%), fugue (51% lifetime), derealization (59%), and depersonalization (55%). Dissociative amnesia was not diagnosed often, probably because at the time of the study the diagnostic criteria for amnesia required sudden onset, a criterion that was deleted in the DSM-IV edition (Cardeña & Spiegel, 1996). All patients who reported early abuse in Bowman’s study also had a dissociative disorder diagnosis. Their median Dissociative Experiences Scale (DES; Bernstein & Putnam, 1986) score was 27. In a later study with a larger sample, Bowman and Markand (1996) found an incidence of 89% somatoform disorders, 91% dissociative disorders (especially DDNOS), 64% affective disorders, 62% personality disorders, and 49% PTSD. Using the Structured Clinical Interview for DSM-IV Dissociative Disorders-Revised (SCID-D; Steinberg, 1994), 98% of the sample qualified for lifetime occurrence of amnesia (82% of lifetime amnesia not related to a seizure), 78% had identity alteration, 64% reported ego states or alter personalities, 87% had depersonalization, and 56% derealization. The median DES score was 14.4, and the mean was 20.2.

Finally, in a sample of 15 PNES and 15 ES patients, Bowman and Coons (2000) found that although the former had a higher DES mean, the difference was not statistically significant. However, PNES patients had significantly higher total and subscale SCID-D-R scores, except for derealization (Steinberg, 1994). It is worth pointing out that these studies did not employ blind conditions.

In a study comparing 132 PNES with 169 matched ES, the former had higher DES means (15.1 vs. 12.7), although not significantly so ($p < .1$); medians for the group were not reported (Alper et al., 1997). There were three items found to have a significantly higher endorsement by individuals with PNES (“feeling as though one’s body is not one’s own,” “staring off into space unaware of the passage of time,” “missing part of a conversation”). A factor analysis revealed that PNES was related to significantly greater depersonalization and, marginally ($p = .056$) to less amnesia. Irrespective of diagnosis, individuals reporting early abuse scored higher on two factors, depersonalization and absorption; there was no significant interaction between abuse report and diagnosis.

Finally, Kuyk, Spinhoven, Van Emde Boas, and Van Dyck (1999) analyzed the files of 65 patients with PNES, 94 with temporal lobe epilepsy (TLE), and 40 with non-temporal lobe epilepsy (n-TLE). They found that the PNES patients had significantly higher SCL-90 scores than the other two groups, significantly higher Dissociation Questionnaire (DIS-Q, Vanderlinden, Van Dyck, Vandereycken, Vertommen, & Verkes, 1993) scores than the n-TLE group, and significantly higher Somatoform Dissociation Questionnaire-20 (SDQ-20, Nijenhuis, Spinhoven, Van Dyck, Van der Hart, & Vanderlinden, 1996) scores than the TLE group. However, when scores for the Symptom Checklist 90 (SCL-90, Derogatis, 1977) were covaried out, only the SDQ-20 discriminated between the PNES and TLE groups. Nonetheless, the SDQ-20 did not add significant variance to diagnostic classification after accounting for gender, age, and the presence of sexual abuse.

Absorption, the propensity to fully deploy one’s attention on internal or external stimuli, often associated with qualitative alterations in consciousness, has been hypothesized to be a risk factor in some forms of psychopathology (see Cardena, Lynn, & Krippner, 2000). In addition, it has a consistent, although usually small, correlation with hypnotizability, which has been associated with PNES, and a robust correlation with the similar construct of fantasy proneness (Putnam & Carlson, 1998). The constructs of imaginative involvement and fantasy proneness, which are very similar to that of absorption, have been related to a developmental history of punishment and trauma, and an enhanced risk of psychopathology (Hilgard, 1979; Lynn & Rhue, 1988; Rauschenberg & Lynn, 1995). Bryant (1995) studied a sample of three groups of women who had either reported sexual abuse as

occurring before or after age 7, or not at all. Although a measure of current anxiety did not differentiate the groups, the two groups of abused participants scored significantly higher than the non-abused group in the Tellegen Absorption Scale (TAS, Tellegen, 1982; means of 26.92, 19.4, and 13.7, respectively) and the Inventory of Childhood Memories and Imaginings (ICMI, Wilson & Barber, 1981; means of 29.47, 20.6, and 17.75, respectively). With respect to parental loss and its implications on the offspring, Hesse and Van Ijzendoorn (1998) report that an important loss by the parents within a 2 year span before or after the respondent's birth was associated with slightly higher scores on the TAS.

GENDER

In a review of 25 PNES cases, Standage (1975) found that 84% were women; Scott (1982) reported a 94% incidence. Most studies have replicated a preponderance of women among PNES patients, with a range between a low of 53% (Binder et al., 1998) and a high of 92% (Bowman, 1993). Other studies and reviews fall between 64%-88% (Alper, Devinsky, Perrine, Vasquez, & Luciano, 1993; Alper et al., 1997; Arnold & Privitera, 1996; Bowman, 1993; Breier et al., 1998; Gates, Ramani, Whalen, & Loewenson, 1985; Gross, 1983; Lempert & Schmidt, 1990; Lesser, 1985; Meierkord et al., 1991; Snyder, Rosenbaum, Rowan, & Strain, 1994; Wilkus, Dodrill, & Thompson, 1984; Wyllie et al., 1991). When the sex ratio in ES and PNES patients was directly compared, three studies found significant differences between the 2 diagnoses (Alper et al., 1993; Gates et al., 1985; Kuyk, Spinhoven, Van Emde Boas, & Van Dyck, 1999), whereas two did not (Arnold & Privitera, 1996; Breier et al., 1998). In a sample partly derived from a VA center, where a preponderance of male patients would be expected, there was no gender difference (Binder et al., 1998). A recent summary concluded that the female:male ratio among PNES is about 4:1 (Gates & Rowan, 2000, p. 111).

With respect to gender differences, Van Merode, de Krom, and Knottnerus (1997) observed that male PNES patients had a very high (80%) preponderance of tonic-clonic seizures, as compared with a much higher presentation diversity among women.

REPORTED HISTORY OF TRAUMA

Various non-blind studies have concurred that there is a considerably greater incidence of early trauma among PNES than in ES patients and the population at large. In Bowman and Markand's 1996 study, 84% of PNES

respondents reported some type of pre-adult or adult trauma (67% in the case of early trauma), a similar figure to that obtained in an earlier study (88%; Bowman, 1993) and in that by Arnold and Privitera in 1996 (86% reporting some type of trauma). Alper et al. (1993) observed that 32% of individuals with PNES reported early abuse; in a later study (1997), they had a significant difference in abuse rate between patients with PNES and ES (38% vs. 20%). A similar rate (44%) for any type of abuse was reported by Kuyk, Spinhoven, Van Emde Boas, and Van Dyck (1999), although only sexual abuse was significantly higher in PNES than in ES (physical abuse was marginally higher, $p = .053$). Regarding the issue of corroboration, Betts and Boden (1992) found that 54% of women with PNES had corroborated childhood sexual abuse, with an unspecified, larger percentage reporting abuse but lacking independent corroboration. Besides early abuse, PNES is also related to revictimization, more prevalent and stressful negative life events, and current ruminations about negative events (Bowman & Markand, 1999; Tojek et al., 2000).

SEIZURE CHARACTERISTICS

Various non-blind designs have reported seizure onset, years of recurrence, and frequency for PNES and ES (Bowman, 1993; Bowman & Markand, 1996; Kuyk et al., 1995; Tojek et al., 2000; Wilkus et al., 1984). Consistently, the age of onset for PNES is later than for ES, usually in the third decade of life in North America, and PNES have persisted for fewer years (a mean of 4-8 years). The typical PNES occurs around the person's third decade of life in North American samples compared to ES that have a mean age of onset in the early to mid second decade of life. The earlier age of onset for PNES in the Dutch study (Kuyk et al., 1995) raises the possibility of cultural differences in the presentation or detection of PNES. Collecting cross-cultural data with the same, validated, instruments seems essential to understand this difference and may have important clinical implications.

METHOD

Participants

Study participants ($N = 45$) were selected from patients undergoing a week-long inpatient evaluation for medically refractory and poorly controlled seizures at The Northern California Comprehensive Epilepsy Center at the University of California Medical Center. Historically, 80-90% of the

150 patients seen annually at the center are found to have epileptic seizures; the remaining 10-20% have PNES. Due to the low probability of PNES, a purposive non-probability sampling approach was used. To increase the odds of including PNES patients in the study, the attending neuropsychologist screened patients for possible PNES, directing to the study those who did not have a structural lesion likely to be causing the seizures, who met age criteria, and whose English was sufficient to participate in the project. Most of the patients referred to the study were deemed by the neuropsychologist to be as likely to have PNES as ES.

Participation was voluntary and unpaid. We informed volunteers that their medical treatment would not be prejudiced on the basis of participation or non-participation in the research. At the conclusion of the project, a summary of the findings was sent to volunteers who wished to receive them. Exclusionary criteria included evidence of progressive neurological disorder or mental retardation, and side effects from anti-convulsant medications or other collateral medical treatments. Age range for inclusion was between 18 and 55 years of age.

Procedure

The center's neuropsychologist asked patients meeting study criteria whether they were willing to talk with an investigator about participating in a research project. Volunteers were interviewed in their private hospital rooms and provided informed consent, before starting data collection. We used a form inquiring about demographics and seizure variables (age at onset, years of recurrent seizure, frequency and type of seizures), and the Dissociative Disorders Interview Schedule (DDIS), followed by the Stanford Hypnotic Clinical Scale (SHCS). Volunteers also completed the Dissociative Experience Scale (DES) and the Tellegen Absorption Scale (TAS) at their own pace over the course of their hospital stay.

After data collection, the attending neurologist diagnosed participants, using simultaneous CCTV (close-circuit television)/EEG monitoring of seizure events to confirm a diagnosis of epileptic or nonepileptic seizures. Conducting data collection before diagnosis allowed for blind conditions to reduce the likelihood of reactivity in the tests as an effect of the diagnosis.

Measures

The Dissociative Disorders Interview Schedule (DDIS) is a 131-item structured interview that takes 30-45 minutes to administer. The DDIS version used was designed to evaluate DSM-III-R dissociative disorders, variables associated with dissociation (Schneiderian first rank symptoms, trance-

like episodes, secondary features associated with DID and extrasensory perceptual experiences), and background history questions (substance abuse, psychiatric history and incidence of childhood and/or adult abuse experiences). The DDIS has been found to have good clinical reliability and validity, with overall inter-rater reliability of 0.68, sensitivity of 90% and specificity of 100% for the diagnosis of multiple personality disorder (Ross et al., 1989).

The *Dissociative Experiences Scale (DES)* is a 28-item self-report questionnaire, developed by Bernstein and Putnam (1986), that quantifies the frequency of dissociative experiences in both normal and clinical populations; it is widely used to assess the presence of major dissociative psychopathology. In order to more specifically compare groups of symptoms, three subscales based on factor analyses were developed, although one of the authors recommends cautious use (Carlson & Armstrong, 1994). They are: (a) dissociative amnesia; (b) depersonalization/derealization; and (c) absorption/imaginative involvement. The DES is widely used and has very good reliability and validity (Bernstein & Putnam, 1986).

The *Tellegen Absorption Scale (TAS)* is one of 11 primary scales that comprise the Multidimensional Personality Questionnaire (MPQ; Tellegen, 1982). The TAS consists of 34 true-false items that address internal and external absorption. The original items were derived by Tellegen and Atkinson (1974) based on inventories of everyday "hypnotic-like" experiences. The TAS has very good reported internal reliability (Tellegen, 1982). A low to moderate correlation between absorption and hypnotizability has been typically reported, and Roche and McConkey (1990) note that the construct of absorption may not be a unitary phenomenon. TAS questions were randomly embedded with 24 items of the Well-Being scale of the MPQ to avoid a response set bias.

The *Stanford Hypnotic Clinical Scale (SHCS)* is a 20-minute standardized clinical test for hypnotic susceptibility, whose scores range from 0-5 and correlate highly with the "gold standard" of hypnotic susceptibility, the Stanford Hypnotic Susceptibility Scale, Form C (Hilgard & Hilgard, 1975).

Statistics

All dichotomous dependent variables were analyzed using chi-square tests. Continuous dependent variables that are normally distributed in the population were analyzed with t-tests or analysis of variance (ANOVA). Research suggests that scores on the Dissociative Experience Scale (DES) and hypnotic susceptibility are not normally distributed in the general population (Bernstein & Putnam, 1986; Hilgard & Hilgard, 1975). As a result, scores on the DES and SHCS were analyzed using a Kruskal-Wallis test (chi-square approximation) for both pairwise and 3-group comparisons. All study hy-

potheses were tested at the 0.05 alpha level of significance, using one-tailed testing to test hypotheses and two-tailed tests for post-hoc analyses.

Hypothesis-Testing

Five hypotheses were tested: as compared with ES volunteers, PNES volunteers will (a) present with a greater level of dissociative symptomatology, (b) have a higher incidence of sexual and/or physical abuse in their backgrounds, (c) report higher absorption, and (d) be significantly more hypnotizable. We also predicted that (e) the DES, TAS and SHCS scores would accurately predict PNES group membership at better than chance level probability.

RESULTS

Characteristics of the Sample

Out of the initial 45 patients, 31 were eventually diagnosed as having ES, 10 as PNES, and 4 patients could not be classified because they did not experience seizures while in the hospital. Of the 31 epileptic patients, 18 patients had seizures with a confirmed temporal lobe focus, 10 with a right temporal lobe focus, and 8 with a left temporal lobe focus. The remaining 13 epileptic patients had seizures whose origins were either clearly non-temporal lobe, or unclear and requiring further medical evaluation. In the latter group, 5 patients had confirmed non-temporal lobe origins while 8 had undetermined foci.

To maximize the classificatory potential of dissociative symptoms, epileptic seizure patients were initially divided into 2 subgroups: Group 1 consisted of patients having a confirmed temporal lobe focus (ES/TL, $N = 13$), Group 2 consisted of those with either a non-temporal lobe focus or unknown focus (ES/NTL, $N = 18$). Both the combined ES groups and its two subgroups singly were compared with the PNES group. Because dividing the ES individuals into the two subgroups did not produce any significant differences, we present inferential statistics on the combined ES groups.

As presented in Table 1, there were no significant differences between the ES and PNES respondents in age, employment status, marital status or education, although the mean age of the ES group was nearly 5 years older than that of the PNES group. Statistically significant differences between the two groups were found for sex: Male participants constituted 54.8% of the ES group, whereas female participants made up 100% of the PNES group ($\chi^2 = 12.95, p < .001$).

Seizure History

The ES and PNES groups differed significantly in all seizure clinical history features studied, including mean age of seizure onset, mean years of recurrent seizures and mean number of seizure-like events occurring on a weekly basis. As shown in Table 2, the ES patients tended to have initial onset of seizures at an earlier age, had a wider age range of onset, had a significantly lower mean number of seizure-like events per week, and had a much higher mean number of years of recurrent seizures.

Hypothesis 1: Dissociative Disorders and Experiences

As shown in Table 3, as measured by the DDIS, the incidence of dissociative disorders diagnoses among all study participants was relatively high; 22

TABLE 1. Demographic Characteristics of Participants

	ES	PNES	p-value
Mean age in years (SD)	35.2 (8.9)	30.5 (9.9)	.169
Sex; N (%)			
male	17 (54.8)	0 (0)	.0003*
female	14 (45.2)	10 (100)	
Employment; N (%)			
employed	18 (60)	6 (60)	1.000
unemployed	12 (40)	4 (40)	
Marital status; N (%)			
married	15 (50)	3 (30)	.264
single	15 (50)	7 (70)	
Education in years (SD)	13.4 (1.8)	13.6 (2.9)	.828

Note: There is missing data for one ES participant on employment and marital status.

* $p < .0005$, two-tailed.

TABLE 2. Seizure History of Participants

	ES	PNES	p-value
Mean age of seizure onset in years (SD)	14.7 (9.3)	22.6 (8.3)	.022*
Mean years of recurrent seizures (SD)	19.7 (9.7)	7.7 (8.3)	.001**
Mean number of seizures per week (SD)	5.1 (6.0)	11.4 (13.6)	.045*

Note: A minimum of one seizure-like event per year was required to count as a recurrent year of seizures.

* $p < .05$

** $p = .001$, two-tailed.

TABLE 3. Differences Between ES and PNES Patients on DSM III-R Diagnoses

Diagnoses; N (%)	ES N = 31	ES/NTL N = 13	ES/TL N = 18	PNES N = 10	Total N = 41
Psychogenic amnesia	9 (29.0)	4 (30.8)	5 (27.8)	4 (40.0)	13 (31.7)
Psychogenic fugue	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Depersonalization	5 (16.1)	3 (23.1)	2 (11.1)	3 (30.0)	8 (19.5)
MPD	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
DDNOS	0 (0)	0 (0)	0 (0)	1 (10.0)	1 (2.4)
Sum of DSM III-R diagnoses	14 (45.2)	7 (53.8)	7 (38.9)	8 (80.0)	22 (53.7)
Total patients with one or more DSM III-R diagnosis	12 (38.7)	6 (46.2)	6 (30.0)	5 (50.0)	17 (41.5)

Note: A positive DSM III-R diagnosis was made based on the patient's reported experience of dissociative symptoms, irrespective of whether they may have arisen from an organic or a functional condition.

of 41 patients or 53.7% presented with one or more dissociative disorder diagnoses, regardless of seizure origin. (In the case of ES patients, dissociative symptoms occurring exclusively in reference to epilepsy would not qualify as symptoms of a dissociative disorder, but for comparison purposes we are disregarding that distinction). Although not statistically significant, perhaps because of the study's limited power, there was a considerably higher incidence of dissociative disorder diagnoses among PNES participants. Whereas 80% of the former received a dissociative diagnosis, 45.2% of ES patients did. When the incidence for different DSM III-R diagnoses were examined, amnesia (31.7%) and depersonalization (19.5%) occurred most frequently, especially among PNES.

Participants were also compared with regard to dissociative-like experiences, whether or not they referred to organic epileptic seizures. As shown in Table 4, the PNES group endorsed significantly more depersonalization symptoms $t(1, 39) = 2.13, p < .025$ and also showed a trend for having more first rank symptoms, extrasensory perceptual experiences, and secondary Dissociative Identity Disorder (DID) features. More than 50% of the patients in both groups endorsed items referring to depression and trance-like episodes.

With regard to the DES, as hypothesized, the PNES group median total score of 21.79 was markedly higher than the ES group score of 11.07, but this difference was not statistically significant ($\eta^2 = .83, df = 1, p > .05$). Although numerically the absorption (15.28 vs. 6.11) and depersonalization (30.94 vs. 16.88) subscale scores of the PNES were notably higher than those of ES, the

TABLE 4. Associated Dissociative Features on the DDIS

Seizure Type	ES N = 31	ES/NTL N = 13	ES/TL N = 18	PNES N = 10	Total N = 41
DDIS Item					
History of major depression, N (%)	18 (58.1)	7 (53.8)	11 (61.1)	6 (60.0)	24 (58.5)
History of trance-like episode(s) N (%)	24 (77.4)	10 (76.9)	14 (77.8)	7 (70.0)	31 (75.6)
First rank symptoms; mean N (SD)	1.58 (2.3)	1.77 (2.2)	1.53 (2.3)	2.0 (3.1)	–
Depersonalization symptoms; mean (SD)	.65 (1.0)	.77 (.89)	.56 (1.07)	1.56 (1.3)*	–
Extrasensory experiences; mean (SD)	.71 (1.0)	.54 (.75)	.83 (1.12)	.90 (1.6)	–
Secondary MPD features; mean (SD)	2.7 (2.2)	2.85 (1.71)	2.56 (2.48)	3.2 (3.7)	–

* $p < .025$, one-tailed.

amnesia scores were similar (11.59 vs. 9.09), suggesting that amnesia discriminates the least between the two groups.

Hypothesis 2: Physical and Sexual Abuse

As shown in Table 5, non-epileptic patients reported a significantly higher prevalence rate of sexual abuse than ES patients ($\chi^2 = 8.25$, $df = 1$, $p < .01$). Sixty percent of the PNES group reported past incidences of sexual abuse in comparison with 13% for the ES group. Even more revealing is the sharp contrast in duration of sexual abuse. Non-epileptic patients reported a mean of 25.4 months ($SD = 40.4$, with a range of 1-108 months) while ES patients reported a mean of 0.13 months ($SD = 0.34$, and a consistent range of only one month), a statistically significant difference $t(1, 39) = 3.58$, $p < .0005$. It is also not surprising to find that of the 6 PNES patients who reported a history of sexual abuse, 4 patients (67%) reported more than one episode of sexual trauma. In contrast, of the 4 ES patients with a history of sexual abuse, none reported experiencing more than one episode of sexual trauma. Although not reaching statistical significance, physical abuse was reported by a higher percentage of the PNES than the ES (50% vs. 29%), and as lasting longer.

Hypothesis 3: Tellegen Absorption Scale (TAS)

The PNES and ES groups did not differ significantly ($M = 17.2$, $SD = 6.49$; $M = 16.71$, $SD = 6.59$, respectively, $p > .05$), and their mean TAS scores

TABLE 5. Abuse History of Participants

Seizure Type	ES N = 31	PNES N = 10	Total N = 41
History of abuse; N (%)			
Physical	9 (29.0)	5 (50.0)	14 (34.1)
Sexual	4 (12.9)	6 (60.0)*	10 (24.4)
Duration of abuse in months; mean (SD)			
Physical	31.7 (59.3)	70.8 (87.9)	–
Sexual	0.13 (.34)	25.4 (40.4)**	–

Note: Data obtained from the DDIS.

* $p < .005$, one-tailed

** $p < .001$, one-tailed

were close to that of a normative sample of 265 female and 265 male college students ($M = 19.8$, $SD = 7.5$; Tellegen, 1982). We also compared the TAS scores for volunteers with and without a history of physical and/or sexual abuse. The mean TAS for those who reported a history of one or more episodes of abuse was 19.20 ($SD = 5.8$), versus 14.84 ($SD = 6.4$) for those without abuse histories, a significant difference ($t(1,43) = 2.36$, $p < .05$).

Hypothesis 4: Hypnotizability

Contrary to our hypothesis, there was no significant ($\chi^2 = 1.23$, $df = 1$, $p > .05$) difference in hypnotizability between PNES and ES; if anything, the latter had a higher mean. Mean scores for the ES group ($M = 2.6$, $SD = 1.4$) corresponded closely to the mean scores in a normative study of Stanford undergraduates ($M = 2.75$, $SD = 1.56$, Hilgard & Hilgard, 1975). In contrast, half of the PNES patients scored in the low level of hypnotizability and, as a group ($M = 2.0$, $SD = 1.6$), tended to be less hypnotizable than normal young adults.

Hypothesis 5: Prediction of Group Membership

When using a logistic regression with TAS, DES, and SHCS scores to predict diagnosis, with a cutoff probability of $= .50$, only one out of 10 patients with PNES was correctly classified. In contrast, all patients with ES were correctly classified. Overall, 100% of the ES diagnoses but only 10% of PNES diagnoses were correctly classified, for an overall 77.5% diagnostic accuracy.

Post-Hoc Analyses

A post-hoc logistic regression procedure was performed using the variables that were highly significant: sex ($p < .0005$), years of recurrent seizures ($p < .001$), history of sexual abuse ($p < .005$), and months of sexual abuse ($p < .001$); with the more stringent alpha level of .01 used to control for type 1 errors. These variables jointly were excellent predictors of PNES. As shown in Table 6, 9 out of 10 PNES patients were correctly classified, and 30 of 31 patients with ES were correctly classified, giving a sensitivity of .9 and specificity of .967 for PNES diagnosis. When corrected for prevalence of PNES among PNES and ES patients (taking 20% as prevalence of PNES among outpatients, a common finding in other studies, see Bowman, 1998), the positive predictive value was .87, the negative predictive value was .97.

A stepwise forward selection analysis was then conducted to determine which of these four variables contributed most to the prediction of PNES. A cutoff significance level of .01 was again used to adjust for type 1 errors. Length of sexual abuse, fewer years of recurrent seizures, and being female contributed significantly to the prediction of PNES. The resultant logistic regression equation was: $Z = -23.53 + (13.26) \text{ sex} + (-.33) \text{ years of recurrent seizures} + (1.51) \text{ duration of sexual abuse}$.

The distribution of prediction probabilities for this exploratory model indicated that PNES and ES predictions could be made with considerable confidence. Prediction probabilities for both the NES and ES patients who were correctly classified were significantly above the .50 even odds cutoff point, ranging from .90 to 1, suggesting a small likelihood of making a false negative or false positive diagnosis of PNES or ES using this model.

DISCUSSION

The lack of difference in hypnotizability between the PNES and ES groups did not replicate previous studies and the common observation about the high

TABLE 6. Classification Using Demographic and Seizure Variables

	Predicted Classification		
	ES	PNES	% Correct
Observed			
ES	30	1	96.77
PNES	1	9	90.00
		Overall	95.12

hypnotizability of PNES patients. One important difference between this and other studies is our use of a double-blind procedure. A possibility is that PNES patients may have, consciously or not, suppressed their hypnotic ability in order to present as medical, rather than psychological, patients (see Spiegel & Spiegel, 1978). Also, review of the process notes showed that some PNES patients spontaneously expressed the fear of losing physical and/or emotional control during hypnosis (in contrast, no ES patient expressed this fear). Transferential issues may help explain this difference, especially considering that most of these patients had a reported history of early abuse, were female and were tested by a male researcher with whom they did not have a pre-existing therapeutic relationship.

Finally, Bowman (personal communication, July 25, 2000) has observed in a large series of cases that individuals with PNES include different types: very highly suggestible individuals, some who try to maintain control at all times, and some with limited cognitive capabilities. A study with a large sample of PNES could test this potentially important observation. In any case, our results suggest that further research is needed on the relationship between hypnotizability and different subsets of PNES patients. History of abuse, personality and cognitive variables, and transferential issues should be tested as mediating or moderating variables. In the meantime, hypnotizability should not be considered a reliable measure of PNES status.

The considerable percentages of ES and, particularly, PNES participants who fulfilled dissociative disorder criteria according to the DDIS are in line with previous findings and support the contention that PNES might be considered dissociative in nature, and that ES are often associated with various dissociative phenomena (Cardeña, Lewis Fernández, Beahr, Pakianathan, & Spiegel, 1996). Although we did not find a statistically significant difference in prevalence of dissociative disorders between PNES and ES patients with our relatively small N, a thorough diagnostic interview for the dissociative disorders has previously identified greater dissociation among PNES patients (Bowman & Coons, 2000). It certainly seems worthwhile to further study total, subscale, and item score differences between individuals with PNES and ES.

The median DES scores we obtained for PNES participants are remarkably close to that of previous studies and were higher than those for the ES group, but given the high within-group score variance, they are unlikely to be reliable indicators for a differential diagnosis, in agreement previous studies. Looking at the DES subscales, our data that amnesia least differentiated the two groups is consistent with Alper et al.'s (1997) report of marginally higher amnesia among ES patients. Considering the frequent occurrence of episodes of amnesia during generalized and partial complex seizures, and pathological dissociation (cf. Waller, Putnam, & Carlson, 1996), this result is not surpris-

ing. Also in agreement with Alper et al. (1997), we obtained an almost 3-fold higher mean depersonalization score among PNES than ES volunteers, although the difference was not significant in our smaller N.

This may be the first study that has related the TAS to PNES, ES, and a history of abuse. Our finding that absorption was significantly higher among those reporting a history of abuse is consistent with previous findings, and our data are remarkably similar to those that Bryant (1995) obtained with individuals reporting sexual abuse or no abuse at all. Although ours is a retrospective study with the consequent limitations, it lends some support to formulations that absorption and fantasy proneness may partly develop from a history of abuse. The results could also be interpreted as indicating that individuals with a proneness to fantasy and absorption might have just fantasized the abuse, but various studies have found substantial independent corroboration for reports of early abuse both among PNES (Betts & Boden, 1992) and dissociative patients (e.g., Coons, 1994).

While neither the dissociation instruments nor hypnotizability were sensitive or specific diagnostic predictors, we got a very different story when looking at demographic and seizure variables. The much higher preponderance of women among PNES patients replicates previous studies. There is also evidence that, compared with men, women in the general population present with much higher rates of somatoform disorders in general (Kirmayer & Taillefer, 1997), experience more dissociation around the time of trauma (e.g., Cardeña & Spiegel, 1991; Koopman, Classen, & Spiegel, 1996), perceive some stressful events as more distressing (Caballo & Cardeña, 1997), and generally have a greater probability of developing PTSD after a traumatic event (e.g., Breslau & Davis, 1992). The greater incidence of somatoform disorders (including PNES), PTSD, and dissociation might be partly explained by the greater rate of sexual abuse of women than of men (Finkelhor & Barron, 1986; Stein, Walker, & Forde, 2000). Nonetheless, the possibility that hormonal and neurological differences between the genders (Springer & Deutsch, 1993) may help explain some of these difference should be investigated.

We also replicated a significant relationship between history of sexual abuse and PNES (and a trend for more early physical abuse). Nonetheless, we cannot assume a simple causal link between early abuse and PNES, not the least because not all people with PNES report early abuse, and very few of those reporting early abuse present with PNES. Furthermore, sexual abuse may also be associated with physical abuse (Widom, 1997) and ensuing CNS damage, current negative life events and abuse (Tojtek et al., 2000), and a greater risk of later revictimization (Bowman & Markand, 1999; Tojtek et al., 2000; see also Moeller, Bachmann, & Moeller, 1993). Finally, other dynamics such as ongoing stress and lack of social acknowledgement of early and ongoing abuse may mediate the effect of abuse on the prevalence of PNES (Griffith, Polles, & Griffith, 1998).

Our results strongly suggest that a single incident of sexual abuse is not as valid a predictor of PNES as length of abuse, consistent with pronouncements that chronic abuse is more likely to lead to dissociation than single incidents (Terr, 1991; Gold & Cardeña, 1993). Nonetheless, Betts and Duffy (1993), among others, remind us that there are other etiologies to PNES besides sexual and other trauma, and that some ES patients do have early trauma history as well, as was borne out in our study. It will be important in future studies to also consider other abuse-related factors such as early neglect and attachment style as potential risk factors (see Brunner, Parzer, Schuld, & Resch, 2000; Hesse & Van Ijzendoorn, 1998).

In our sample, PNES patients had significantly later mean age of seizure onset and fewer years of recurrent seizures, and more than twice the number of seizures per week than ES patients. These results replicate previous North American studies, but are not fully consistent with the Dutch studies. Whether this difference can be explained by methodological or cultural variations requires further study.

This study was limited by the modest sample size and the consequent limited statistical power, and the large standard deviations on some instruments. Also, because PNES is diagnosed by exclusion, conceivably some of these patients may later be found to have ES. Extra-ictal dissociative symptoms have been documented in a non-blind study of PNES (Bowman & Markand, 1996), but studies are needed to compare dissociative symptoms outside of seizure episodes in ES and PNES subjects. It may be fruitful to also investigate specific phenomenal items, rather than total scores. We are conducting a qualitative study of seizure phenomenology in this sample, to evaluate possible experiential differences (Cardeña & Litwin, 2000).

When looking at the logistic regression analysis of the significant demographic and seizure variables, we obtained an outstanding level of sensitivity and specificity, especially impressive considering the blind nature of the study. The results of this and other studies strongly suggest that female gender, reports of multiple trauma incidents lasting months or years, initial seizure onset in late teens or twenties, and seizure attacks daily or more often should alert the diagnostician to possible PNES status. Although the predictive value of these variables needs to be investigated further, the conclusion by Devinsky and Paraiso (2000) that “Historical features traditionally associated with NES, such as . . . a history of physical or sexual abuse . . . cannot reliably distinguish NES from ES” (p. 33) needs to be qualified, especially when abuse chronicity, rather than incidence, is used jointly with other demographic and seizure variables.

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