



Research Article

Characteristics of Patients Diagnosed with Psychogenic Non-Epileptic Seizures (PNES) Who Request Reinstatement of Their Driving Privileges

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Abstract

Objective: To compare patients with psychogenic non-epileptic seizures (PNES) who requested reinstatement of driving privileges or reported having resumed driving to those who did not. **Methods:** Diagnosis of PNES was confirmed with video-EEG. Demographic and clinical data and requests for reinstatement of driving privileges (requiring 6 or more months seizure freedom) and reports of decisions to resume driving were noted. Self-report questionnaires of depression, anxiety and PTSD that were administered as part of neuropsychological assessment were analyzed. **Results:** Of 73 patients with PNES evaluated in 2018-2021, 22 later applied for driving privileges or reported that they resumed driving. When the two groups were compared, the group that applied for driving privileges or decided to resume driving was determined to be significantly less depressed ($p = 0.014$) when initially assessed than the group that did not. **Conclusion:** Resumption of driving behavior is an explicit measure of improvement for PNES because patients are advised to discontinue driving until they are seizure-free for a determined time span. Findings revealed that initial lower experienced levels of depression symptoms were associated with subsequent reported seizure-freedom which allowed for the reactivation of driving privileges. This underscores the importance that depression may have on PNES prognosis and supports assessing and treating comorbid mood symptoms in a timely manner.

Keywords: Functional Dissociative Seizures; Driving; Prognosis; Depression; Anxiety; Disability.

Highlights

- Resumption of driving behavior is an explicit measure of improvement in PNES (seizure-freedom).
- Lower depression at the time of evaluation was associated with subsequent seizure-freedom and driving resumption.
- PTSD symptoms at the time of evaluation were not associated with seizure-freedom and driving resumption.
- Anxiety symptoms at the time of evaluation were not associated with seizure-freedom and driving resumption.
- Timely treatment of depression may be important in PNES prognosis.

Introduction

Psychogenic non-epileptic seizures (PNES), also known as functional dissociative seizures, are paroxysmal events that closely resemble epileptic seizures, but lack electrophysiological correlates or clinical evidence for epilepsy. As the name suggests, PNES are associated with psychological risk factors and psychiatric comorbidities, and therefore are categorized as a type of functional neurological disorder (FND)/conversion disorder within the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition [1]. If misdiagnosed or left untreated, PNES can be associated with considerable economic and healthcare costs. Case in point, in Ireland, the annual healthcare cost for patients with undiagnosed PNES was reported at €20,995.30 per patient [2] and in Canada, was reported at \$22,939.10 per patient prior to initiating psychotherapeutic treatment tailored for PNES [3].

Furthermore, an outcome study revealed that even after being correctly diagnosed, of those who continued to experience seizures, nearly 30% became unemployed [4,5] and over half applied for disability status/social security benefits [4,6]. Similarly, a descriptive study of PNES patients seen in a tertiary epilepsy center in Czech Republic found that nearly 50% of the sample was receiving disability benefits [7]. Another study that included various FNDs found that patients who reported greater distress were more likely to be unemployed citing health reasons and were more likely to be receiving disability-related assistance when compared to patients with symptoms explained by a neurological disease [8]. It is important to understand the characteristics of those who recover from PNES, and resumption of driving is a reliable measure of recovery because driving can have important legal consequences and is only allowed once the patient is seizure-free for an established time span.

In many countries including the United States, most patients who develop seizures lose driving privileges and are not permitted to resume driving unless they have achieved a determined period

of seizure-freedom which varies by state (eg 3 months to 1 year). In some locations, patients are also required to have been cleared by a physician [9]. As a matter of fact, NJ law requires physicians “treating any person 16 years of age or older for recurrent convulsive seizures or for recurrent periods of unconsciousness or for impairment or loss of motor coordination due to conditions such as, but not limited to, epilepsy in any of its forms, when such conditions persist or recur despite medical treatments, shall, within 24 hours after his determination of such fact, report the same to the Director of the Division of Motor Vehicles.” (NJ Rev Stat § 39:3-10.4 (2013)). After being reported, the Division of Motor Vehicles (DMV) may then suspend that person’s license. That suspension may be lifted when the agency receives a statement from the patient’s treating physician indicating that a seizure-free period of six months has been achieved that is in turn considered indicative that they are physically capable of driving. Other states may not have a mandatory reporting provision, but patients are counseled by the treatment team on why they should not drive until they are seizure-free. Therefore, driving is intrinsically associated with seizure-freedom though local regulations may vary. Although driving prohibitions can be necessary, they limit independence and can impact on the individual’s ability to earn an income, fulfill household chores, and socialize. This is especially true in countries like the United States, where a majority of people are dependent on driving in comparison to European countries where the public transport structure is of high quality, both in big cities and small towns [10].

In this retrospective study, a chart review identified patients seen between 2018 and 2021 who requested resumption of driving privileges in NJ or who lived in another state and reported that they were seizure-free and had resumed driving. Psychological symptoms reported during neuropsychological testing at the time of the initial evaluation and clinical and psychiatric variables were examined. It was hypothesized that patients who resumed driving would likely present with less severe clinical characteristics at the time of assessment, such as lower reported levels of depression, anxiety, and PTSD symptoms. We supposed that these variables might affect seizure outcome and therefore also the pursuit of increased independence represented by driving privileges.

Methods

A subset of patients diagnosed with PNES (2018 to 2021) at the Northeast Regional Epilepsy Group were included in the study. The Northeast Regional Epilepsy group is an epilepsy program located in New York (NY) and NJ. It is composed of 24 epilepsy monitoring units of which three are Level-4 epilepsy programs and is a major referral center in the region for the evaluation of patients who present with seizures. Part of the PNES evaluation protocol includes a referral for neuropsychological testing with a clinical neuropsychologist.

For the present study, exclusion criteria included 1) patients diagnosed with PNES and epilepsy; 2) PNES patients younger than 18 years (due to age-restrictions on driving) and 3) patients who requested reinstatement of driving privileges or who began driving before neuropsychological testing took place. Requests for reinstatement of driving privileges (requiring 6 months seizure freedom in NJ) or information on date of resumed driving were noted. The sample was divided into two groups: a) those who applied to resume driving or resumed driving on their own after being seizure free (for at least 6 months in NJ and at least 12 months in NY) and b) those who did not. To ensure that both groups were comparable, the following variables were examined: duration of PNES, employment status, past psychiatric history (including the presence of any mood, anxiety, and psychotic disorders), reported experience of psychological trauma, history of or current participation in psychiatric/psychological treatment, and seizure frequency (calculated as “seizures per day”- for example, one seizure per week would translate into 1/7 (0.14), one seizure per month would translate into 1/30 (0.03) and 3 seizures per week would translate into 3/7 (0.43)).

The dependent variables used to compare the two groups were scores from self-report questionnaires including: the Center for Epidemiologic Studies-Depression scale (CES-D) [11], the State Trait Anxiety Inventory (STAI) [12] and the Posttraumatic Diagnostic Scale (PDS) [13]. These questionnaires were completed as part of a comprehensive neuropsychological evaluation completed by a licensed psychologist. Of those patients who had requested reinstatement or who had resumed driving on their own, 6 were missing data for at least one questionnaire. Of those who had not, 8 were missing data for at least one questionnaire. Data from these patients were included in the analyses.

The Center for Epidemiological Studies-Depression (CES-D) is a 20-item measure that is used to assess experienced levels of symptoms of depression (e.,g poor sleep and appetite, sadness, hopelessness) over the prior week. Responses include: 0 = Rarely or None of the Time, 1 = Some or Little of the Time, 2 = Moderately or Much of the time, and 3 = Most or Almost All the Time. The minimum score is 0 and the maximum is 60, with higher scores representing higher levels of depression symptoms [14]. A 2016 meta-analysis “demonstrated good sensitivity (0.87) and specificity (0.70) using a cut-off of 16” [15].

The State Trait Anxiety Inventory (STAI) is a 40-item measure of trait and state anxiety. Respondents are asked to rate their experienced level of symptoms at the time of testing (from

1 for not at all to 4 for very much so) and more generally in their daily lives (from 1 for almost never to 4 for almost always). These raw scores may then be converted to standard scores based on gender and age. A 2015 study “demonstrated sensitivity of 78.3 and specificity of 71.2 using a cut-off of 41” [16].

The Posttraumatic Diagnostic Scale (PDS-5) is a self-report questionnaire consisting of 24-items assessing experienced levels of PTSD symptoms in the prior month. Symptoms for each of the 20 DSM-5 PTSD diagnostic criteria are rated on a 5-point scale of frequency and severity, from 0 (Not at all) to 4 (occurring 6 or more times a week/severe). Cut-off scores are available for determining overall level of severity of symptoms, from minimal to very severe (including 0-10 for minimal symptoms; 11- 23 for mild symptoms; 24- 42 for moderate symptoms; 43-59 for severe symptoms; and 60-80 for very severe symptoms). A 2015 study demonstrated “high levels of sensitivity (0.78) and specificity (0.98) using a cut-off of 38 for a provisional diagnosis of PTSD” [17].

Statistics

For statistical analyses, qualitative variables were compared using chi-square analyses. Quantitative variables were compared utilizing t-tests. The level of significance chosen was <0.05.

Ethics

All data collection, storage and processing were done in compliance with the Helsinki Declaration. All patients provided signed, informed consent. This study was approved as part of a larger records review study approved by the WCG Connexus IRB (IRB Tracking ID 420150649). LK was supported by Ministry of Health of the Czech Republic, grant MH CZ and DRO (NHH, 193001) IG193001 and IG223001.

Results

A total of 73 patients with a history of PNES were included (61 identified as female, 11 as male and 1 as “non-binary”). Of those, 22 had submitted paperwork for reinstatement of driving privileges or had resumed driving on their own (group 1) and 51 had not and were not driving (group 2).

Demographic and clinical characteristics of the two groups

The two groups were comparable as there were no significant differences for any of the following characteristics: gender, level of education (i.e., years of schooling), mean age, working status, percentage reporting a history of psychiatric diagnosis, self-reported history of trauma, those reporting a history of

psychological/psychiatric treatment, mean seizure frequency, and mean duration of seizures (in years). (Table 1)

Variable	Group 1 Mean (SD)	Group 2 Mean (SD)	Significance
Gender	18 female 4 male	43 female 7 male 1 non-binary	$\chi^2 = 0.645$ $p = 0.724$
Age	32.46 (13.40)	32.88 (12.40)	$t = -0.132$ $p = 0.45$
Education	14.86 (2.27)	14.18 (2.62)	$t = 1.068$ $p = 0.86$
Work status	7 Y 15 N	16 Y 35 N	$\chi^2 = 0.001$ $p = 0.970$
History of trauma	18 Y 4 N	42 Y 9 N	$\chi^2 = 0.003$ $p = 0.956$
History of psych treatment	21 Y 1 N	41 Y 10 N	$\chi^2 = 2.725$ $p = 0.099$

Table 1: Demographic and clinical characteristics of patients who requested to resume driving (group 1) and those who did not (group 2).

Comparison between groups on psychometric measures

Depression: When the two groups were compared on a measure of mood, results demonstrated a significant difference in total raw score assessing reported level of depression symptoms (CES-D, $t = -2.232$, $df = 69.000$, $p = 0.014$) between group 1 (20.864 (14.001)) and group 2 (29.163 (14.697)). The driving resumption group was less depressed than the group who had not.

Anxiety: A trend approaching significance was seen for total raw score assessing reported level of anxiety state at the time of the evaluation (STAI - State, $t = 01.550$, $df = 63.000$, $p = 0.063$) between group 1 (43.136 (14.775)) and group 2 (48.628 (12.845)); the first group reported lower anxiety state than the second. No significant difference was observed between the two groups on total raw scores assessing anxiety trait (STAI -Trait, $t = -0.628$, $df = 63.000$, $p = 0.266$).

PTSD symptoms: No significant differences were observed between the two groups on total raw scores assessing reported level of trauma symptoms (PDS-5, $t = -0.742$, $df = 51.301$, $p = 0.231$) (Table 2).

	Group 1 Mean (SD)	Group 2 Mean (SD)	Significance
CES-D	20.864 (14.001)	29.163 (14.697)	$t = -2.232$ $df = 69.000$ $p = 0.014$
STAI-State	43.136 (14.775)	48.628 (12.845)	$t = -1.550$ $df = 63.000$ $p = 0.063$
STAI-Trait	50.364 (11.802)	52.605 (14.432)	$t = -0.628$ $df = 63.000$ $P = 0.266$
PDS	31.647 (12.196)	35.297 (23.908)	$t = -0.742$ $df = 51.301$ $p = 0.231$

Table 2: Comparison between groups on psychometric measures.

Discussion

Gaining a better understanding of the characteristics of patients with PNES who achieve seizure-freedom is especially important for the clinicians who work with them. For the reasons detailed in the introduction, driving resumption is a generally reliable and sound measure of improvement. To our knowledge this is the first study to examine the demographic and clinical features and psychometric scores of depression, anxiety, and post-traumatic symptomatology of patients with PNES who have recovered sufficiently as to resume driving. All previous publications regarding driving and PNES have focused on physician decision making or patient driving behavior (compliance with driving restrictions and involvement in driving accidents) [18-22]. Our study demonstrated a significant difference between the group that returned to driving and the one that did not on reported level of depression symptoms around the time of diagnosis. The former demonstrated lower levels of depression than the latter. More profound depression has been associated with worse prognosis in PNES [23] which could be considered consistent with our results regarding lower depression in the patient group that reported seizure-freedom and decided to resume driving.

Within other populations, previous studies that have compared individuals who drive to those who avoid or cease driving have reported depression as a potential contributor to driving avoidance and cessation [24,25]. In one study, participants aged 70 and older (647 drivers and 53 participants who ceased driving) were examined at baseline and two years later. Results showed that depression was significant in driving cessation; it was speculated that drivers who did not resume driving might have done so because they experienced diminished control beliefs [25]. Particularly with PNES, which is a disorder in which patients often report a sense of diminished self-control due to the erratic and unexpected nature of seizures, diminished control beliefs associated with depression might have a compounding effect on this sense. Furthermore, it is understood that depressive cognitive distortions can lead to impaired self-appraisals and less effective problem-solving [26-28] which could impact the decision to pursue reinstatement of driving privileges. In contrast, a more realistic view of one's resources combined with a sense of agency is often associated with resilience and general psychological well-being [23] which might support resumption of driving. Further examination of our study's results showed that anxiety scores did not correlate with driving resumption although the group that did not seek to drive again revealed a trend towards higher anxiety, at least at the time of being evaluated. This is consistent with what might be expected regarding higher anxiety and avoidance or premature cessation of driving [29].

Further examination of our sample's results also revealed that scores on a trauma measure (PDS) did not correlate reported

seizure-freedom and driving resumption. This was surprising as lower PTSD symptomatology could be thought to correlate positively with recovery (seizure-freedom). However, a recent study revealed that a diagnosis of PTSD was, in fact, associated with a reduction in the number of seizures at follow up [28]. The authors of that study speculated that this might be so because the association between the diagnosis of PTSD and PNES may be easier for the patients to understand and there are tailored treatments for PTSD which can result in recovery. A growing body of research indicates that trauma-focused treatments can be beneficial in recovery of patients dually diagnosed with PNES and PTSD [30].

Lastly, the two groups did not differ significantly on work status which suggests that external (occupational) responsibilities did not seem to have a substantial impact on who sought out driving privileges or not. This may be partly affected by temporary leaves of absence or disability benefits that can be obtained through work. However, it merits mention that the lack of correlation with work and driving differed from reports in a study from Iran in which resumption of driving was significantly associated with seizure-freedom and employment [19]. Socio-cultural differences may explain these divergent findings. On the other hand, it is possible that some of the patients with PNES decided to pursue driving privileges because they had improved to the point of being interested in working again or actually resuming working in some capacity, thus prompting them to resume driving. This potential relationship could be addressed in a follow-up study.

Limitations to this study include the fact that the sample was small and drawn from a single medical group center, albeit one that receives patients from several states in the United States. Also, the study may have included patients who resumed driving without reporting this to their doctor's office and some who may have simply chosen to not resume driving regardless of their PNES. Lastly, in some cases, driving may have been disallowed for another medical condition which would then not require paperwork to be completed at the epilepsy program. Future studies may decide to use the resumption of driving in patients with PNES as a useful marker regarding patient improvement. Other future research directions might include employing a larger sample and examining additional psychometric characteristics in patients who resumed driving. Long-term follow-up comparing seizure characteristics, productivity, emotional assessments and coping strategies between those who resume driving and those who do not might also prove fruitful. Thirdly, prospective studies could query specifics that were involved in the patients' decision-making process to return to driving.

In sum, our findings revealed that lower experienced levels of depression symptoms at initial assessment were associated with subsequent reported seizure-freedom which then allowed patients

to return to driving. This suggests that depression at the time of initial assessment may be an important prognostic factor regarding improvement in seizures (as assessed through driving resumption). As such, targeting mood in patients diagnosed with PNES and comorbid depressive symptoms may be important in recovery and may help promote a quicker return to pre-seizure life.

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