



Semiological and psychiatric characteristics of children with psychogenic nonepileptic seizures: Gender-related differences



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ABSTRACT

Purpose: To compare semiological characteristics, precipitating stress factors and psychiatric diagnoses of girls and boys with psychogenic nonepileptic seizures (PNESs).

Methods: We retrospectively reviewed medical records of children diagnosed with PNES and who also underwent psychiatric evaluation. Sixty-two children (44 girls, 18 boys), aged 11–18 years (mean age 14.19 ± 1.96 years) were included. Diagnosis of PNES was established by any of the following: (1) observation of the seizure by a neurologist and routine EEG, (2) evaluation of amateur video records of the typical seizure and routine EEG, or (3) video-EEG monitoring. Psychiatric examinations of patients were performed using the Schedule for Affective Disorders and Schizophrenia for School Age Children–Present and Lifetime Version (KSADS-PL).

Results: Tremor was the most prevalent ictal motor sign in both girls and boys. Atonic falls and longer episodes were significantly more frequent in girls than boys. Tonic–clonic-like movements of the extremities were significantly more prevalent in boys than girls. No gender-specific differences were observed in the rates of semiological types. Academic underachievement was the most prevalent precipitating stressor for boys, and was significantly more prevalent in boys than girls. The rate of major depression was significantly higher in girls than boys. The most prominent diagnosis in boys was attention deficit/hyperactivity disorder, and this was significantly more prevalent than in girls.

Conclusion: PNES in males of juvenile age may be a distinct entity from that in girls with different semiological and psychogenic correlates. Consideration of these gender-related differences may be beneficial for the early recognition and treatment of PNES.

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1. Introduction

Psychogenic nonepileptic seizure (PNES) is an observable paroxysmal change in behavior or consciousness that resembles an epileptic seizure, without cortical abnormal electrical discharge, but originating from psychogenic factors [1]. PNES in children is mostly associated with significant impairment in functioning and psychopathology. Recent research has shown that the PNES population is etiologically and experientially heterogeneous [2]. Determination of semiological characteristics and underlying

psychogenic factors is beneficial for the accurate recognition and management of PNES. PNES is more commonly seen in females although some authors have described a decrease in female predominance in younger age groups [3]. We think that the results of previous studies of PNES may largely reflect the characteristic of female patients and males with PNES may have distinct semiological and psychiatric features.

The few previous studies of gender-related differences in PNES involved adults as sample groups [4,5]. To the best of our knowledge, no previous studies have investigated gender-related differences in children and adolescents with PNES. The purpose of this study was therefore to compare girls and boys with PNES in terms of semiology, associated stress factors and psychopathology. The main hypothesis of this study was that semiological and psychiatric correlates of PNES in children may vary by gender.

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2. Methods

Children diagnosed with PNES and who underwent psychiatric examination between January 2013 and January 2014 were included in this retrospective study. Diagnoses of psychogenic seizures were established by: (1) observation of the seizure by a neurologist and routine sleep/non-sleep EEG ($n = 8$, 12.8%), (2) evaluation of amateur home video records of the typical seizure and routine sleep/non-sleep EEG ($n = 13$, 21%), or (3) video-EEG monitoring ($n = 41$, 66.2%). We think that inclusion of participants diagnosed by video-EEG alone might result in the inclusion of more severe forms of PNES, since this is more commonly used for the diagnostic elucidation of refractory seizures. Our aim was to establish a sample that actually reflected the semiological and psychiatric characteristics of children with PNES in the general population. For these reasons, this study did not include only those patients whose PNES was diagnosed by video-EEG. Patients underwent video-EEG monitoring if one of the following was present: (1) semiological heterogeneity, (2) clinical suspicion of epilepsy, or (3) EEG abnormalities. All of the recorded events and EEGs were analyzed by two experienced child neurologists (H.A.T. and H.İ.) in order to confirm the presence or absence of paroxysmal epileptiform activity and clinical manifestations typical of psychogenic or epileptic seizures. Diagnosis of PNES was based on consensus between the two neurologists. Videotapes or witnessed seizures were also validated by clinical history and were discussed with the parents to confirm that the attacks were typical of the previous seizures. Semiological characteristics of PNES diagnosed by neurologist observation were recorded in detail. Cardiological evaluation was performed in order to rule out syncope if the patient experienced sudden collapses as a manifestation of seizures.

All children diagnosed with PNES were routinely examined by the department of child and adolescent psychiatry for evaluation and treatment of co-existing psychogenic factors. Sociodemographic features and psychosocial difficulties were evaluated routinely using a demographic form inquiring into the history of precipitating stress factors such as relational problems (parental conflicts, or interpersonal problems with siblings, friends and teachers), academic underachievement (low grades, repeating a grade or learning problems), physical/sexual abuse and other traumatizing or stressful life events (separation, parental divorce, migration, death, health problems, or financial problems), and medical history.

Psychiatric examinations were performed using the Schedule for Affective Disorders and Schizophrenia for School Age Children–Present and Lifetime Version (KSADS-PL) by a child and adolescent psychiatrist (G.N.S.) based on the interviews with adolescents and parents. The KSADS-PL is a semi-structured interview schedule designed to assess psychiatric disorders in children and adolescents on the basis of DSM-IV criteria [7]. The reliability and validity study of KSADS-PL has been established for the Turkish population [8].

We retrospectively reviewed medical records (neurology and psychiatry), amateur video records and video-EEG records of all children diagnosed with PNES. All diagnoses of PNES and psychiatric disorders were completed before this retrospective analysis. The semiology of a typical attack in each patient was analyzed and recorded in detail. The events were classified according to the categories described by Seneviratne et al. [6]; dialeptic type, rhythmic motor, complex motor, hypermotor, subjective or mixed. Written informed consent was obtained from all subjects and their parents. The research was approved by the Ondokuz Mayıs University Faculty of Medicine ethical committee.

2.1. Statistical analysis

Data were analyzed using SPSS (SPSS Inc, Chicago, IL). The chi-square test was used to compare girls and boys. A $p < 0.05$ was regarded as statistically significant.

3. Results

3.1. Demographical and medical history data

Sixty-two adolescents aged 11–18 years (mean age 14.19 ± 1.96 years) diagnosed with PNES were included in the study. The study group was composed of 44 girls (71%) and 18 boys (29%). Most patients (61%) were living in urban areas. Mean time from the beginning of the pseudoseizures until diagnosis was 10.23 ± 11.727 months. Co-existing epilepsy was present in 25 (40.3%) patients. Eighteen (29%) subjects had previous psychiatric referrals. Thirty-two (51.6%) patients were receiving antiepileptic drug treatment, and 20% were taking antidepressants. No significant difference was determined between girls and boys in terms of mean age, place of residence, education, socioeconomic status, duration of illness, comorbidity of epilepsy, pharmacological treatment or parental education levels.

3.2. Semiological characteristics

Tremor was the most prevalent ictal motor sign in the entire sample (27.4%) and also in both girls (22.2%) and boys (38.9%). Atonic falls were significantly more prevalent in girls (34%) compared to boys (5.6%). Girls (84%) were significantly more likely than boys (64%) to have seizures continuing longer than 2 min. Tonic–clonic-like movements of the extremities were significantly more frequent in boys (16.7%) than girls (2.3%). Twenty-five (40.3%) participants had one symptom during the event while 23 (37%) of them manifested two symptoms and 14 (22.7%) had more than two symptoms. The frequency of each symptom and comparisons between girls and boys are shown in [Table 1](#).

3.3. Semiological classification

There were no statistically significant differences between girls and boys in terms of semiological types. Distribution of PNES events according to Seneviratne et al.'s classification and comparisons thereof are shown in [Table 2](#).

3.4. Precipitating stress factors

Relational problems with peers were the most frequent stressor for girls (50%) although this was not significantly different to the rate in boys (44.4%). The most frequent stressor for boys was academic underachievement (83%), the rate being significantly higher than in girls (47%). Girls and boys were similar in terms of rates of other psychosocial stress factors (family conflict, relational problems, physical/sexual abuse and stressful/traumatizing life events). Precipitating stress factors are shown in [Table 3](#).

3.5. Psychopathology

The rates of comorbid psychiatric disorders were significantly higher in boys (83.3%) than in girls (56.8%). Major depression was the most prominent psychiatric disorder (31.8%) in girls, the rate in girls being significantly higher than in boys (5.6%). Attention deficit/hyperactivity disorder (61%) and disruptive behavior disorders (33%) were the most frequent diagnoses in boys, and were significantly more prevalent in boys than in girls (9% and 4.5%). Comorbid psychiatric disorders are summarized in [Table 4](#).

Table 1
Frequency of individual symptoms.

	Girls N = 44 N %	Boys N = 18 N %	Total N = 62 N %	χ^2	<i>p</i>
Abrupt onset	16 (36.4%)	8 (44.4%)	24 (38.7%)	0.352	0.553
Atonic fall	15 (34%)	1 (5.6%)	16 (25.8%)	5.433	0.020
Asynchronous limb movements	5 (11.4%)	4 (22.2%)	9 (14.5%)	1.214	0.271
Hyperventilation	2 (4.5%)	0	2 (3.2%)	0.845	0.358
Hypoesthesia	12 (27.3%)	6 (33.3%)	18 (29%)	0.228	0.633
Ictal violent movements	6 (13.6%)	2 (11%)	8 (13%)	0.072	0.788
Ictal crying	5 (11.4%)	0	5 (8.1%)	2.250	0.136
Ictal eye closure	24 (54.5%)	8 (44.4%)	32 (51%)	0.522	0.470
Ictal duration (>2 min)	37 (84%)	11 (61%)	48 (77.4%)	3.859	0.040
Pelvic thrusting	2 (4.5%)	1 (5.6%)	3 (4.8%)	0.028	0.866
Semiological heterogeneity	8 (18.2%)	4 (22.2%)	12 (19.3%)	0.133	0.714
Side to side head shaking	0	1 (5.6%)	1 (1.6%)	2.485	0.115
Trembling of limbs	10 (22.2%)	7 (38.9%)	17 (27.4%)	1.677	0.195
Tonic-clonic limb movements	1 (2.3%)	3 (16.7%)	4 (6.5%)	4.385	0.036
Unresponsiveness	15 (34%)	7 (38.9%)	22 (35.5%)	0.128	0.720
Visual/auditory aura	3 (6.8%)	1 (5.6%)	4 (6.5%)	0.034	0.854
Vocalization	7 (18%)	2 (11.1%)	9 (14.5%)	0.472	0.492

Bold values indicate statistically significance

4. Discussion

Girls and boys with PNES exhibited significant differences in terms of semiological characteristics, stress factors and comorbid psychiatric disorders. In agreement with previous studies, we observed a female predominance in children with PNES. One study reported that 65% of patients aged 12–18 years with PNES were girls and 35% were boys [3].

4.1. Semiological characteristics

One remarkable finding was that tremor was the most common motor sign in both girls (22.2%) and boys (38.9%). Tremor was present in 27.4% of all patients and was observed more frequently in the upper than the lower limbs. Additionally, pelvic thrusting was observed very rarely (4.8%) in this study. This finding was compatible with the results of a previous study reporting tremor as the most frequent motor sign (25%) and pelvic thrusting as a rare phenomenon (2.7%) in children with PNES [9].

Another interesting finding from this study was that atonic falls were observed in one fourth of children and were significantly more prevalent in girls compared to boys. Atonic falls were accompanied by unresponsiveness with no motor movements, and these seizures were classified as dialeptic type in this study. A wide variety of terminology has been used in previous studies to define patients with abrupt atonic collapses with unresponsiveness and with no motor manifestations, including “swoons” [10] and “psychogenic atonic seizures” [11]. The frequency of atonic falls in our study was similar to the results of some previous studies, but dissimilar to others. Irwin et al. reported that of 35 children with

PNES, 10 (28.5%) experienced “swoons” during which they slid to the floor and remained still and unresponsive [10]. Gröppel et al. reported the rate of atonic falls as 25.9% in adults and classified these events as “psychogenic atonic seizures” [11]. In another study, collapse attacks with limpness were present in one third of 110 patients [12]. In contrast to these results, one study of PNES in juveniles reported that collapse was not observed in most of their patients since they were confined to bed for monitoring [9].

Tonic-clonic-like movements were significantly more prevalent in boys than girls in this study. Similarly, one review of case reports investigating gender-related differences in non-epileptic attacks reported that tonic-clonic type seizures were common in males [4].

4.2. Semiological classification

Girls and boys were similar in terms of semiological types. Dialeptic type (unresponsiveness with no motor movements) was the most frequent semiological type in the overall sample (30.6%). This result was consistent with a previous study reporting dialeptic seizures as the most frequent type in children with PNES, at 29.3% [9]. Similarly, Kotagal et al. [3] reported that unresponsiveness without motor manifestations was the most common feature of psychogenic seizures in both children and in adolescents with PNES. In contrast to Szabo et al. [9], who reported no hypermotor PNES in children, 12.9% of events in our study were classified as hypermotor type.

4.3. Precipitating stress factors

Another finding of this study was that precipitating stress factors in children with PNES also differed by gender. Relational problems with peers was the most frequent stressor for girls (50%), while boys reported academic underachievement as the most prevalent stress factor (83%). Academic difficulty was also the most common stressor (58%) in the entire study group, in agreement with the results of some previous studies [13–15].

4.4. Psychopathology

Children with PNES are at high risk for comorbid psychopathology particularly depression and anxiety [16]. In our study, 64.5% of children had at least one psychiatric disorder. One

Table 2
Categorization of PNES according to Seneviratne et al.'s classification.

	Girls N = 44 N %	Boys N = 18 N %	Total N = 62 N %	χ^2	<i>p</i>
Dialeptic type	15 (34%)	4 (22.2%)	19 (30.6%)	3.427	0.634
Rhythmic motor	8 (18%)	5 (27.7%)	13 (20%)		
Complex motor	9 (20.4%)	3 (16.6%)	12 (19%)		
Hypermotor	4 (9%)	4 (22.2%)	8 (12.9%)		
Nonepileptic aura	5 (11.3%)	1 (5.5%)	6 (9.6%)		
Mixed pattern	3 (6.8%)	1 (5.5%)	4 (6.4%)		

PNES: Psychogenic nonepileptic seizure.

Table 3
Precipitating stress factors.

	Girls N=44 N %	Boys N=18 N %	Total N=62 N %	χ^2	<i>p</i>
Parental conflicts	11 (25%)	4 (22.2%)	15 (24.2%)	0.054	0.817
Problems with siblings	14 (31.8%)	9 (50%)	23 (37.1%)	1.810	0.179
Problems with peers	22 (50%)	8 (44.4%)	30 (48.4%)	0.158	0.691
Problems with teachers	7 (15.9%)	3 (16.7%)	10 (16.1%)	0.005	0.941
School underachievement	21 (47.7%)	15 (83.3%)	36 (58.1%)	6.651	0.009
Physical abuse	12 (27.2%)	7 (38.8%)	19 (30.6%)	0.811	0.367
Sexual abuse	5 (11.3%)	0	5 (8.1%)	2.224	0.135
Stressful/traumatizing events	19 (43%)	6 (33.3%)	25 (40.3%)	0.514	0.473

Bold values indicate statistically significance.

Table 4
Psychiatric diagnoses of participants.

	Girls N=44 N %	Boys N=18 N %	Total N=62 N %	χ^2	<i>p</i>
Comorbid psychiatric disorder	25 (56.8%)	15 (83.3%)	40 (64.5%)	3.92	0.048
ADHD	4 (9%)	11 (61%)	15 (24%)	18.848	<0.001
Major depression	14 (31.8%)	1 (5.6%)	15 (24%)	4.804	0.028
Anxiety disorders	7 (16%)	5 (27.8%)	12 (19.5%)	1.153	0.283
Disruptive behavior disorders	2 (4.5%)	6 (33.3%)	8 (12.9%)	9.420	0.002
PTSD	5 (11.4%)	2 (11.1%)	7 (11.2%)	0.001	0.977
Substance abuse	3 (6.8%)	1 (5.6%)	4 (6.4%)	0.034	0.854
Tic disorder	2 (4.5%)	0	2 (3.2%)	0.845	0.354
Bipolar affective disorder	0	1 (5.6%)	1 (1.6%)	2.484	0.114
Enuresis	1 (2.2%)	0	1 (1.6%)	0.415	0.519
Suicide attempt	6 (13.6%)	0	6 (9.6%)	2.717	0.099

ADHD: attention deficit hyperactivity disorder, PTSD: posttraumatic stress disorder.

Bold values indicate statistically significance.

previous study reported a prevalence of comorbid psychopathology of 48.6% in adolescents with PNES [13]. Bhatia et al. reported that 84% of children with PNES had co-existing psychiatric disorders [15].

Girls and boys with PNES in this study exhibited significant differences in terms of comorbid psychopathology, which was significantly more prevalent in boys (83.3%) compared to girls (56.8%). Dissimilar results have also been reported, however, in studies investigating gender-related differences in adults with PNES. Thomas et al. reported significantly lower rates of history of abuse and history of prior psychiatric diagnosis in men compared to women [17]. In another study, demographic characteristics, seizure characteristics and semiology were similar between the genders [18].

We identified major depression as the most prevalent diagnosis in girls (31.8%). To the best of our knowledge, this is the first study reporting ADHD (61%) and disruptive behavior disorders (33%) as the most frequent psychiatric disorders in boys with PNES. Similarly, a previous study reported ADHD (29.4%) and depression (26.4%) as the two most common diagnoses in juvenile age PNES [19]. There is evidence for female predominance in depression and male predominance in ADHD in the general population [20,21]. However, our study revealed that prevalences and gender ratios of depression and ADHD may be significantly higher in patients with PNES than in the general community.

This study had some limitations, the most important being its retrospective design. The number of male participants was limited compared to the number of females in this study. Additionally, the rate of conversion disorder could not be evaluated in the PNES group since the semi-structured interview KSADS-PL does not include this diagnosis.

5. Conclusion

Identification of semiological characteristics and underlying psychogenic factors is essential for the early diagnosis and management of PNES. We investigated gender-related differences in children with PNES. Atonic falls and longer spells were significantly more frequent in girls than in boys. We observed no differences in the rates of semiological categories between girls and boys. Academic underachievement was the most prevalent precipitating stressor for boys. Girls and boys exhibited significant differences in terms of psychopathology, with major depressive disorder being the most frequent diagnosis in girls and ADHD in boys. The results of this study suggested that PNES in boys should be considered as a distinct entity from that in girls, with different semiological and psychogenic features. Consideration of these gender-related differences by child neurologists and child psychiatrists may be beneficial when dealing with pediatric PNES.

Conflict of interest

The authors declare that they have no conflict of interest.

References

- [1] Bodde NM, Brooks JL, Baker GA, Boon PA, Hendriksen JG, Mulder OG, Aldenkamp AP. Psychogenic non-epileptic seizures—definition, etiology, treatment and prognostic issues: a critical review. *Seizure* 2009;18(8):543–53.
- [2] Wiseman H, Reuber M. New insights into psychogenic nonepileptic seizures 2011–2014. *Seizure* 2015;29:69–80.
- [3] Kotagal P, Costa M, Wyllie E, Wolgamuth B. Paroxysmal nonepileptic events in children and adolescents. *Pediatrics* 2002;110(4):e46.

- [4] Van Merode T, De Krom MCTFM, Knottnerus A. Gender-related differences in non-epileptic attacks: a study of patients' cases in the literature. *Seizure* 1997;6:311–5.
- [5] Oto M, Conway P, McGonigal A, Russel AJ, Duncan R. Gender differences in psychogenic non-epileptic seizures. *Seizure* 2005;14:33–9.
- [6] Seneviratne U, Reutens D, D'souza W. Stereotypy of psychogenic nonepileptic seizures: insights from video-EEG monitoring. *Epilepsia* 2010;51:1159–68.
- [7] Kaufman J, Birmaher B, Brent D, Rao U, Flynn C, Moreci P, Williamson D, Ryan N. Schedule for affective disorders and schizophrenia for school-age children-present and lifetime version (K-SADS-PL): initial reliability and validity data. *J Am Acad Child Adolesc Psychiatry* 1997;36(7):980–8.
- [8] Gokler B, Unal F, Pehlivanurk B, Cengel Kultur E, Akdemir D, Taner Y. Okul cagi cocuklari icin duygulanim bozukluklari ve sizofreni gorusme cizelgesi-simdi ve yasam boyu sekli-Turkce uyarlanmasinin gecerlilik ve guvenirligi. *Cocuk ve Genclik Ruh Sagligi Dergisi* 2004;(11):109–16 [in Turkish].
- [9] Szabo L, Siegler Z, Zubek L, Liptai Z, Korhegyi I, Bansagi B, Fogarasi A. A detailed semiologic analysis of childhood psychogenic nonepileptic seizures. *Epilepsia* 2012;53:565–70.
- [10] Irwin K, Edwards M, Robinson R. Psychogenic non-epileptic seizures: management and prognosis. *Arch Dis Child* 2000;82:474–8.
- [11] Groppel G, Kapitany T, Baumgartner C. Cluster analysis of clinical seizure semiology of psychogenic nonepileptic seizures. *Epilepsia* 2000;41:610–4.
- [12] Meierkord H, Will B, Fish D, Shorvon S. The clinical features and prognosis of pseudoseizures diagnosed using video-EEG telemetry. *Neurology* 1991;41:1643–6.
- [13] Patel H, Scott E, Dunn D, Garg B. Nonepileptic seizures in children. *Epilepsia* 2007;48(11):2086–92.
- [14] Verrotti A, Agostinelli S, Mohn A, Manco R, Coppola G, Franzoni E, Cerminara C, Parisi P, Iannetti P, Spalice A, Balestri P, Grosso S, Chiarelli F, Curatolo P. Clinical features of psychogenic nonepileptic seizures in prepubertal and pubertal patients with idiopathic epilepsy. *Neuro Sci* 2009;30:319–23.
- [15] Bhatia MS, Sapra S. Pseudoseizures in children: a profile of 50 cases. *Clin Pediatr* 2005;44:617–21.
- [16] Reilly C, Menlove L, Fenton V, Das KB. Psychogenic nonepileptic seizures in children: a review. *Epilepsia* 2013;54(10):1715–24.
- [17] Thomas AA, Preston J, Scott RC, Bujarski KA. Diagnosis of probable psychogenic nonepileptic seizures in the outpatient clinic: does gender matter? *Epilepsy Behav* 2013;29(2):295–7.
- [18] Asadi-Pooya AA, Emami M, Emami Y. Gender differences in manifestations of psychogenic non-epileptic seizures in Iran. *J Neurol Sci* 2013;332(1–2):66–8.
- [19] Say GN, Tasdemir HA, Akbas S, Yuce M, Karabekiroglu K. Self-esteem and psychiatric features of Turkish adolescents with psychogenic non-epileptic seizures: a comparative study with epilepsy and healthy control groups. *Int J Psychiatry Med* 2014;47(1):41–53.
- [20] Nolen-Hoeksema S, Girgus JS. The emergence of gender differences in depression during adolescence. *Psychol Bull* 1994;115(3):424–43.
- [21] Willcutt EG. The prevalence of DSM-IV attention deficit/hyperactivity disorder: a meta-analytic review. *Neurotherapeutics* 2012;490–9.