Seizure 52 (2017) 182–187

Contents lists available at ScienceDirect

Seizure

journal homepage: www.elsevier.com/locate/yseiz

Engaging psychiatrists in the diagnosis of psychogenic nonepileptic seizures. What can they contribute?

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ARTICLE INFO

Article history:
Received 20 July 2017
Received in revised form 12 October 2017
Accepted 13 October 2017

Keywords:
Psychogenic nonepileptic seizures
Video
Monitoring
Semiology
Epileptic seizures
Psychiatrists

ABSTRACT

Purpose: To investigate if psychiatrists could predict the diagnosis of psychogenic nonepileptic seizures (PNES) by reviewing videos of seizures of various types and to compare the accuracy and the criteria leading to the diagnosis used by psychiatrists with those used by epileptologists.
Methods: Four board-certified psychiatrists were asked to review 23 videos capturing representative events of 21 unselected consecutive patients admitted to an epilepsy center for long-term video-EEG monitoring. All raters were blind to EEG and clinical information. They were requested to (1) rate the videos for quality and content; (2) choose among four diagnoses: (a) epileptic seizures; (b) PNES; (c) Other nonepileptic seizures (syncope, movement disorder, migraine, etc.); (d) "Cannot Say"; and (3) explain in their own words the main reasons leading to the diagnosis of choice. The results were compared to those of four blind epileptologists who independently reviewed the same cases. The inter-rater reliability was tested with the Kappa statistic.
Results: All psychiatrists were concordant and correct in 3/23 video-events, compared to 8/23 among epileptologists. Despite widespread disagreement among themselves and frequent failures as a group, individual psychiatrists scored a comparable number of correct diagnoses as did individual epileptologists. The comments provided to justify the diagnosis of choice differed from neurologists, varied among raters, and reflected considerable attention to body movements and body language.
Conclusion: Psychiatrists, as a group, are less reliable than neurologists in differentiating seizure types on video but, as individuals, can be quite accurate in making the correct diagnosis because they are more attuned to capture the subtleties of human behaviour, of subjective experiences, as the effects of hidden internal conflicts and can contribute a new lexicon in defining PNES.

1. Introduction

Psychogenic nonepileptic seizures (PNES) are episodes of paroxysmal impairment of self-control associated with a range of motor, sensory and mental manifestations that resemble epilepsy and which represent an experiential or behavioural response to emotional or social distress [1]. From the psychiatrist's point of view, since the transition from the DSM-II [2] to the DSM-III [3], the term "neurosis" disappeared from the nosography, and even in the current classification (DSM 5) [4] it is not present; PNES are included in the conversion disorder within the spectrum "Somatic symptoms and related disorders". Thus, symptoms were dissembled in their expression and deprived of their "meaning" in the patient's history. On the other hand, the International Classification of Diseases (ICD-10) [5] places PNES in the Dissociative Disorders although, unlike the DSM-5, it merges Dissociative Disorders and Conversion Disorders. Into this dimension, PNES, that were classified as "hysteria", no longer found their unique position in the DSM, remaining in a place of nowhere, expelled both by psychiatrists and neurologists. This can explain how, despite a 20% prevalence of PNES in a tertiary center for epilepsy [6], the delay in the diagnosis of PNES has been estimated to be 7–8 years [7,8].

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https://doi.org/10.1016/j.seizure.2017.10.014
1059-1311/

At present, except for the combination of video-EEG monitoring (VEM), which is reliable only in the ictal phase, and the sophisticated services available only in specialized centers, an instrument for the diagnosis of PNES is lacking. The International League Against Epilepsy (ILAE) Nonepileptic Seizures Task Force published recommendations indicating that in certain cases it is possible to reach the diagnosis of PNES on clinical grounds in the absence of concomitant VEM [9]. A recent study carried out by our group [10] tried to investigate if visual information contained in video-recorded events allowed experienced epileptologists to predict the diagnosis of PNES without the aid of electroencephalography (EEG) and other clinical information. They were asked to review 23 videos capturing representative events of 21 unselected consecutive patients with a mix of epileptic seizures (ES), PNES and physiologic seizures (other NES). The four raters blind to EEG and clinical information predicted the diagnosis, confirmed by long-term VEM, in 8 of 23 videos (34.8%). The correct diagnoses were all ES or PNES presenting with clear motor manifestations. Predictive ability varied in the remaining videos. Interrater agreement was "moderate" for the overall group; "moderate" for ES; "substantial" for PNES; only "fair" for other NES. These results, based exclusively on video information, were superimposable to those obtained in a comparable trial conducted to test the inter-rater reliability of epileptologists interpreting both video and EEG data combined, also without any other patient information [11].

The aims of the present study were to investigate if, how, and to what extent a group of four psychiatrists could predict the diagnosis on pure visual information, reviewing blindly the same videos submitted to epileptologists in the previous study [10], and to compare the accuracy and the criteria leading to the diagnosis of the psychiatrists vis-à-vis with the epileptologists.

Based on the results of previous trials challenging various categories of medical providers in comparison to fully trained epileptologists [12–16], our expectation was that psychiatrists would fail, mainly because largely unfamiliar with the semiology of ES and because the characteristic features currently used to distinguish ES from PNES reflect neurological measures predominantly reported by epileptologists.

2. Methods

This study represented an extension of the feasibility trial of a larger project currently in progress at the University of Rochester (UR). The study protocol was reviewed and approved by the Research Subject Review Board (RSRB) of the UR where the patients were recruited and the videos recorded.

2.1. Population

Patients 18 years or older consecutively admitted between July 1 and September 10, 2014, were asked to participate. The patients' cohort was the same utilized in the previous study and the details are described elsewhere [10]. For each subject, at the time of discharge, audio-video segments representative of the clinical events were selected and, after removal of the EEG tracing, submitted to the independent raters for review.

2.2. Raters and procedure

Unlike the previous study, the four raters were board certified psychiatrists, each with different psychiatric background, varying degree of seniority, of knowledge about epilepsy and exposure to patients with seizure disorders (Table 1). Each rater was blind to the EEG findings, to the patient's history and comorbidities, and unaware of the final diagnosis established by the clinical team. The task was to review the same videos submitted to epileptologists in the previous study [10] and render a diagnosis out of the following options:

- ES, defined according to the 2017 ILAE classification [17];
- PNES, classified according to the six categories proposed by Seneviratne et al. [18]: 1. Rhythmic motor, 2. Hypermotor, 3. Complex motor, 4. Dialeptic, 5. Nonepileptic auras, and 6. Mixed;
- Other nonepileptic seizures (NES), due to paroxysmal non-epileptic events other than psychogenic (syncope or other dysautonomic manifestations, migraine, movement disorder, panic attacks, etc.);
- "Cannot Say."

In addition, psychiatrists had to specify the reasons leading to the diagnosis of choice and describe any behavioral observations that most contributed to their diagnostic decision.

As previously done by epileptologists, each psychiatrist worked independently and filed the data directly into a database set up at the IRCCS-Pharmacological Research Institute "Mario Negri" in Milano, Italy, for statistical analysis. We evaluated diagnostic accuracy as the ability of each individual rater to correctly predict the "gold standard" (GS) diagnosis, based on audiovisual evidence alone. The GS diagnosis was the result of a comprehensive evaluation of multiple factors. These included the patient's risk factors, comorbidities and psychosocial status; neurological, neuroimaging, interictal EEG findings and the characterization of the events (when recorded). This was based on video semiology, ictal EEG findings (including purely electrical seizures), and the results of monitoring other physiologic parameters such as electrocardiography, blood pressure, orthostatic testing, blood sugar, and so on as appropriate. In the two cases where by GS no diagnosis was possible (NDP), the rater's response "Cannot say" was considered correct. Raters' accuracy in predicting the GS diagnosis was presented as the proportion of raters that correctly predicted the GS.

2.3. Statistical analysis

We calculated interrater agreement among all raters, between pairs of raters, and between each rater and the GS using Fleiss' Kappa [19] with 95% confidence intervals (CIs). The Kappa statistic is a measure of interrater agreement adjusted by the amount of the agreement expected to occur by chance alone. Kappa values were used to assess overall agreement across all diagnostic categories (PNES, ES, Other NES, Cannot Say), and agreement in differentiating between the diagnosis of ES, PNES, Other NES, and Cannot Say. Kappa values were classified as poor (<0.00), slight (0.01–0.20),

Table 1
Individual profile of raters.

Rater	Years in practice	Formal education in epilepsy (Yes/No)	N. of patients with seizure disorders seen during clinical practice	Degree	Specialty training
PS1	30	YES	Hundreds	MD	Psychiatry
PS2	12	YES	6/year	MD	Psychiatry
PS3	30	NO	15/year	MD	Psychiatry
PS4	10	NO	15/year	MD	Psychiatry

fair (0.21–0.40), moderate (0.41–0.60), substantial (0.61–0.80), or almost perfect (0.81–1.00) [20].

Data were analyzed using the SAS statistical package (version 9.2; SAS Institute Inc, Cary, NC, U.S.A.).

3. Results

Table 2 correlates the clinical characteristics of the 23 events submitted for review with the accuracy of the four blind psychiatrists vs. four blind epileptologists in predicting the GS diagnosis as a group and as individual raters.

All four psychiatrists were concordant and correct (4/4) in 3/23 video-events, compared to 8/23 when raters were trained epileptologists. The superiority of the epileptologists as a group is also apparent when the concordance in accurately predicting the diagnosis for each individual video was <4/4 (i.e.: 3/4; 2/4; 1/4; 0/4). Comparison between the two groups shows 12 points (+) advantage in favor of the epileptologists compared to 4 points in favor of the psychiatrists.

Kappa values confirm the discrepancy between the two groups. While overall concordance among the four epileptologists was 0.50, it was 0.18 among the four psychiatrists, similar differences are found in the Kappa values by type of seizures, varying from 0.20 to 0.66 (epileptologists) and from −0.03 to 0.29 (psychiatrists) (Table 3). Likewise, agreement within pairs of epileptologists showed Kappa values varying from 0.34 to 0.73 (Table 4) whereas agreement among pairs of psychiatrists was much lower, ranging from −0.2 to 0.37 (Table 5). Surprisingly, however, agreement of each individual rater with the GS yielded superimposable K values in the two groups, ranging from 0.30 to 0.56 among epileptologists (Table 4) and from 0.01 to 0.45 among psychiatrists (Table 5). Therefore, despite widespread disagreement among themselves and frequent failures as a group, our results indicate that the individual psychiatrists who participated to this study were almost as accurate as the epileptologists in predicting the correct diagnosis after reviewing single events recorded on video.

Success or failure was not correlated to any particular type of event (epilepsy, psychogenic, other physiologic or cannot say). However, raters PS3 and PS4 chose the diagnosis “Cannot say” more often (7/23) than PS1 and PS2 (3/23) while the epileptologists were less variable (6/23, R1 and R3; 4/23, R-2; 5/23, R-4).

The comments provided by the four psychiatrists to justify the diagnosis of choice varied considerably in format and detail from rater to rater, with PS1 being the most attentive and articulate. In essence, like the epileptologists, psychiatrists paid considerable attention to body movements, ostensibly the most obvious signs of the events’ semiology exhibited on video. Starting from the body parts involved, they considered head/eyes/mouth deviation and lateralized limb posturing as clear indicators of ES versus predominant involvement of trunk/hips/fingers as suggestive of PNES. Similarly, they remarked on the following: resistance to eye opening, ‘one single shake’, sudden onset or abrupt interruption, ‘on/off’ and “high frequency” movements as indicators of PNES, but also emphasised more subtle behavioural aspects such as ‘slow motion’, or “irregular, unpredictable” shaking. Likewise, they often opposed the progression of movements from tonic to clonic, from fast to slow, from partial to generalized to the more disorganized motions defined as “non-epileptic” or “pseudo-myoclonic”. Finally, while directly mentioning specific types of movement as ‘side-to-side’ or ‘out of synchrony’, instead of pelvic thrusting they preferred descriptions as ‘arc de circle’ or ‘hips more involved’ or ‘body motions with sexual connotations’.

Table 3
Agreement among four psychiatrists and among four epileptologists.

	Kappa	95% CI	
Psychiatrists			
Overall	0.18	0.08	0.28
PNES	0.21	0.03	0.39
ES	0.29	0.11	0.47
Other	−0.03	−0.21	0.15
Epileptologists			
Overall	0.50	0.32	0.68
PNES	0.66	0.54	0.78
ES	0.48	0.36	0.60
Other	0.20	0.08	0.32

ES: epileptic seizure; PNES: psychogenic non-epileptic seizure.

Table 2
Accuracy of psychiatrists vs. epileptologists in predicting the gold standard diagnosis.

Video	Semiology	Gold standard	PS1	PS2	PS3	PS4	Psychiatrists’accuracy	Epileptogists’ accuracy
1	Motor	ES	ES	PNES	ES	ES	3/4	3/4
2	Non-motor	Other	ES	Cannot say	PNES	ES	0/4	0/4
3a	Motor	PNES	PNES	PNES	PNES	PNES	4/4	4/4
3b	Motor	PNES	PNES	PNES	ES	PNES	3/4	3/4
3c	Non-motor	PNES	PNES	Cannot say	Cannot say	Other	1/4 +	0/4
4	Motor	PNES	PNES	PNES	PNES	Cannot say	3/4	4/4 +
5	Motor	ES	ES	ES	ES	PNES	3/4	3/4
6	Motor	PNES	Cannot say	PNES	Other	Cannot say	1/4	4/4 +++
7	Non-motor	NDP	PNES	Other	Cannot say	PNES	1/4 +	0/4
8	Motor	ES	ES	PNES	ES	ES	3/4	4/4 +
9	Motor	PNES	ES	PNES	PNES	ES	2/4	3/4 +
10	Motor	ES	ES	ES	ES	PNES	3/4	4/4 +
11	Motor	ES	ES	ES	ES	ES	4/4	4/4
12	Non-motor	Other	Cannot say	ES	Cannot say	Cannot say	0/4	0/4
13	Motor	ES	ES	ES	ES	Cannot say	3/4 +	2/4
14	Non-motor	ES	Other	ES	Cannot say	Cannot say	1/4	1/4
15	Motor	ES	ES	ES	ES	PNES	3/4 +	2/4
16	Non-motor	NDP	Other	ES	Cannot say	PNES	1/4	2/4 +
17	Non-motor	PNES	Other	Cannot say	Cannot say	PNES	1/4	3/4 ++
18	Non-motor	Other	Other	Other	Cannot say	Cannot say	2/4	2/4
19	Motor	PNES	Other	PNES	PNES	ES	2/4	4/4 ++
20	Non-motor	Other	Cannot say	ES	ES	Cannot say	0/4	0/4
21	Non-motor	PNES	PNES	PNES	PNES	PNES	4/4	4/4
							4+	12+

PS: psychiatrist; NDP: no diagnosis possible; ES: epileptic seizure; PNES: psychogenic non-epileptic seizure.

Table 4
Agreement within pairs of epileptologists and between each epileptologist and gold standard.

	Overall		PNES		ES		Other	
Pair	Kappa	95% CI	Kappa	95% CI	Kappa	95% CI	Kappa	95% CI
R1 vs. R2	0.73	0.44–1.00	0.82	0.41–1.00	0.63	0.22–1.00	–[a]	–
R1 vs. R3	0.48	0.21–0.75	0.56	0.15–0.97	0.40	−0.01–0.81	−0.05	−0.46–0.36
R1 vs. R4	0.54	0.27–0.81	0.82	0.41–1.00	0.62	0.21–1.00	−0.02	−0.43–0.39
R2 vs. R3	0.34	0.07–0.61	0.56	0.15–0.97	0.25	−0.16–0.66	−0.05	−0.46–0.36
R2 vs. R4	0.40	0.11–0.69	0.63	0.22–1.00	0.45	0.04–0.86	−0.02	−0.43–0.39
R3 vs. R4	0.48	0.23–0.73	0.56	0.15–0.97	0.40	−0.01–0.81	0.64	0.23–1.00
R1 vs. GS	0.49	0.24–0.74	0.82	0.41–1.00	0.81	0.40–1.00	−0.10	−0.51–0.31
R2 vs. GS	0.35	0.08–0.62	0.63	0.22–1.00	0.45	0.04–0.86	−0.10	−0.51–0.31
R3 vs. GS	0.30	0.05–0.55	0.39	−0.02–0.80	0.40	−0.01–0.81	0.23	−0.18–0.64
R4 vs. GS	0.56	0.31–0.81	0.63	0.22–1.00	0.81	0.40–1.00	0.32	−0.09–0.73

ES: epileptic seizure; PNES: psychogenic non-epileptic seizure: R: rater; GS: gold standard; CI: confidence interval.
[a] No reviewers give the response "Other".

Table 5
Agreement within pairs of psychiatrists and between each psychiatrist and gold standard.

	Overall		PNES		ES		Other	
Pair	Kappa	95% CI	Kappa	95% CI	Kappa	95% CI	Kappa	95% CI
PS1 vs PS2	0,19	−0.06; 0.44	0,31	−0.10; 0.72	0,27	−0.14; 0.68	0,16	−0.25; 0.57
PS1 vs PS3	0,27	0.02; 0.52	0,32	−0.09; 0.73	0,63	0.22; 1.00	−0,15	−0.56; 0.26
PS1 vs PS4	0,34	0.09; 0.59	0,31	−0.10; 0.72	0,51	0.10; 0.92	−0,15	−0.56; 0.26
PS2 vs PS3	0,37	0.12; 0.62	0,51	0.10; 0.92	0,45	0.04; 0.86	−0,07	−0.48; 0.34
PS2 vs PS4	−0,2	−0.45; 0.05	−0,09	−0.50; 0.32	−0,29	−0.70; 0.12	−0,07	−0.48; 0.35
PS3 vs PS4	0,06	−0.21; 0.33	−0,09	−0.50; 0.32	0,11	−0.30; 0.52	−0,05	−0.46; 0.36
PS1 vs GS	0,39	0.14; 0.64	0,51	0.10; 0.92	0,72	0.31; 1.00	0,03	−0.38; 0.44
PS2 vs GS	0,43	0.18; 0.68	0,63	0.22; 1.00	0,53	0.12; 0.94	0,23	−0.18; 0.64
PS3 vs GS	0,45	0.20; 0.70	0,51	0.10; 0.92	0,72	0.31; 1.00	−0,12	−0.53; 0.29
PS4 vs GS	0,01	−0.24; 0.26	0,09	−0.32; 0.50	0,18	−0.23; 0.59	−0,12	−0.53; 0.29

ES: epileptic seizure; PNES: psychogenic non-epileptic seizure; PS: psychiatrist; GS: gold standard; CI: confidence interval.

Special attention was given to the presence of "automatisms", distinguishing stereotyped, out of context, complex motor activity (such as aimlessly looking around), typical of complex partial seizures, from comparable motor manifestations that, at close scrutiny, appeared more purposeful or deliberate such as 'subject puts herself at the center of attention' (case #17) or 'slow movements of one hand only' (#3b) or both hands (#21) and more "in context" such as 'movements of postural adjustment' or 'mirror movements' imitating the examiner (#3a) or 'partially in touch with the context but distant, as if confused or waiting to gain time' (#14). Likewise, certain gestures such as 'bringing hands to the chest' or to the head 'as if in pain' or 'holding arms by the breasts' (#3b, #4) were interpreted by psychiatrists as indicative of an inner conflict or suffering. With few exceptions, most of these observations were mentioned to support the diagnosis of PNES.

Finally, psychiatrists pointed out a number of motor system's inconsistencies such as 'holding up a seemingly hypotonic arm', 'falling without body hypotonia' or discrepancies such as the incompatible association between level of consciousness and myoclonic movements' (#3b), as well as behavioral inconsistencies such as the subject's calm, 'almost placid' appearance 'while holding hand with the nearest person' during motor arrest (#21). Table 6 shows a series of representative comments typically made by psychiatrists correlating each observation with the video's number, the rater, the rater's diagnosis and the GS diagnosis.

4. Discussion

By most statistical measures, experienced epileptologists as a group were more skilful than a group of practicing psychiatrists in blindly predicting the GS diagnosis, based exclusively on the physical semiology of a "seizure". This result was expected considering that, contrary to epileptologists, psychiatrists seldom have the opportunity to directly scrutinize events on video. However, whereas degree of interrater agreement within groups was quite different, success rate in the two groups was close when the accuracy of individual raters examining a single video was compared. The comments presented to justify the diagnosis of choice may explain this apparent contradiction. They indicate that psychiatrists, encouraged by training, during the unfolding of an event, detect subtle psycho-dynamic indicators that can be utilized as diagnostic tools in addition to pure semiology. Such signs or manifestations are implicitly part of the currently accepted definition of PNES but can be easily ignored by professionals with less psychodynamic experience.

According to the ILAE recommendations [9], the diagnosis of PNES is essentially based on the following criteria: inconsistent semiology with clinical manifestations that do not conform to a coherent neurological scheme as ES do; lack of the required neurophysiological substrate (ictal EEG discharges); evidence of risk factors that may lead to the "episodic impairment of self-control" as defined by Reuber [1]. The ILAE definition, like the DSM-III definition, fails to unravel the underlying mechanisms of PNES also described as "experiential or behavioural responses to emotional or social distress" [1]. The experiment reported here was an attempt to determine how different and complementary would be the observations of fully boarded psychiatrists compared to those of experienced epileptologists. The results have been somewhat perplexing but encouraging. Despite limited training and unfamiliarity with the type of video material submitted, the individual psychiatrists in our panel, blind to patient's history and EEG findings, proved to be very close to experienced epileptologists in predicting the GS diagnosis. However, they were clearly inferior and in greater disagreement with each other when challenged as a

Table 6
Original observations by psychiatrists.

Video #	Original observations	Diagnosis of choice	Diagnosis GS
3a	Apparent loss of contact after prolonged photic stimulation (PS1)	PNES	PNES-Motor
	Purposeful postural adjustments during eyes opening and closing (PS1)	PNES	PNES-Motor
	Absence of agitated behaviour + calm breathing (PS3)	PNES	PNES-Motor
	Event induced by stress (prolonged photic stimulation) (PS4)	PNES	PNES-Motor
3b	Subtly regains contact bringing hands to chest (PS1)	PNES	PNES-Motor
	Apparent thoracic pain + slow hand movements (PS4)	PNES	PNES-Motor
3c	Bilateral sensory misperceptions (PS1)	PNES	PNES-Non motor
	Mantains contact during psychomotor slowing (PS1)	PNES	PNES-Non motor
	Tendency to disengage from context (PS1)	PNES	PNES-Non motor
4	No pelvic trusting but movements with sexual connotation (PS1)	PNES	PNES-Motor
	Apparent confusion during perception of pain (PS1)	PNES	PNES-Motor
	"Non-epileptic" movements of arms and legs (PS3)	PNES	PNES-Motor
	Indifferent to what has happened (PS3)	PNES	PNES-Motor
	Alert behaviour during seizure (PS4)	PNES	PNES-Motor
7	Looks astonished, slow motions and diffuse malaise (PS1)	PNES	NDP-Non motor
	"Dissociation symptoms" (feels like shaking even if not apparent) (PS2)	Other	NDP-Non motor
	Emotional behavior (PS2)	Other	NDP-Non motor
8	Twilight state, with partial detachment (PS1)	EPILEPSY	EPILEPSY-Motor
9	Arc de circle (PS2)	PNES	PNES-Motor
	Questionable impairment of consciousness/seizure only in presence of witness (PS3)	PNES	PNES-Motor
10	Indifference (PS4)	PNES	EPILEPSY-Motor
13	"Morpheic" event (PS2)	EPILEPSY	EPILEPSY-Motor
14	Appears partially in touch with context but distant, as if confused or wanting to gain time (PS1)	Other	EPILEPSY-Non motor
15	Indifferent attitude (PS4)	PNES	EPILEPSY- Motor
17	During the event, subject puts herself at the centre of attention (PS1)	Other	PNES-Non motor
19	Seizure only when people present (PS3)	PNES	PNES-Motor
21	Falls on bed (no injury) without apparent reasons (PS1, PS2, PS3)	PNES	PNES-Non motor
	"Almost placid" during motor arrest + holding hand of nearest person if still in touch (PS1)	PNES	PNES-Non motor

PNES: psychogenic non-epileptic seizure; GS: gold standard; PS: psychiatrist; NDP: no diagnosis possible.

group. It is possible that such discrepancy in interrater agreement as a group and as individual pairs (high for epileptologists, low for psychiatrists) reflects the different approach in the interpretation of the video material adopted by the two groups. Epileptologists, by training, tend to strictly adhere to pre-set criteria based on semiological features validated in published material. Such disciplined approach confers considerable uniformity to the raters as individuals and as a groups. Conversely, psychiatrists, though paying due attention to the same indicators, are not exclusively bound to evidence-based criteria, displaying greater sensitivity to nuances and to the significance of subtle behavioral features. Table 6 shows examples of how psychiatrists can read into body language and interpret subtle behavioral manifestations or subjective experiences as the effects of hidden internal conflicts. This willingness to explore beyond the mere facts and to capture cryptic signals otherwise ignored in a more orthodox approach, probably explains the success of the psychiatric raters in predicting the correct diagnosis when considering a specific case.

There are no data in the literature that prove the diagnostic validity and reliability of this approach. Our preliminary data indicate that out of 14 videos where at least one of the raters included psychodynamic observations in his comments to justify the diagnostic choice, the diagnosis was correct in 9 (7 PNES; 2 ES) and incorrect in the remaining 5 videos (4 ES and 1 NDP). This suggests that psychiatrists are more successful in diagnosing PNES than other types of seizures. Though the sample was small, our results clearly indicates that the psychodynamic interpretation of certain behavioral signs can be helpful in diagnosing PNES but can also be misleading, especially in differentiating non-motor PNES from complex partial seizures. This represents a diagnostic dilemma also for epileptologists (10). Other possible explanations for the differences between the two groups can be found when comparing the diagnostic attitudes of psychiatrists and neurologists. Psychiatrists lost the habit of diagnosing PNES, as patients with this clinical condition directly go to the neurologist, who makes the first differential diagnosis. On the other hand, the neurologist deals with the “physical” body, that corresponds to the “homunculus” (sensory and/or motor) in the CNS, while psychiatrists deal with the symbolic body [21], that corresponds to the representative language of an original “traumatic” event and whose semiology does not correspond to any “homunculus” of the CNS. The expertise that the psychiatrist can put in the field, in addition to the epileptologist, consists in reading the symbolic body language, for instance the ostensible “indifference”, originally described by Charcot [22]. Contrary to patients with ES, patients with PNES remain partially in touch with the context during the event. Thus, they hesitate, as if they wanted to gain time, and tend to put themselves at the center of attention. In this perspective, psychiatrists consider PNES a unique entity on its own, “something that is” rather than “something that is not”.

Indeed, psychiatrists seem to have poor skills in non-PNES and non-ES attacks, where symbolic body language is virtually absent, while they add elements to the diagnosis of PNES where the symbolic body language is present [23]. Conversely, epileptologists seem to have good skills in motor ES, where topodiagnosis appears more straightforward and simple, while they appear to have less skill in seizures where the relationship between seizure semiology and “homunculus” is less obvious. For this kind of seizures, a simple video documentation seems unsatisfactory. This is true for both the epileptologist and the psychiatrist, because of the imbrication between the somatic and the symbolic body. In these instances, video-EEG or linguistic analysis [24–26] assume an essential role.

In recent years, psychiatrists have been deterred from directly participating in the diagnostic process of identifying PNES by several factors. First, the replacement in the DSM III of the term “hysteria” with a phenomenological classification of symptoms and manifestations devoid from etiological content. That, in itself, has curbed their interest in the condition. Second, the realization that diagnosing PNES has become, by default, a responsibility of the epileptologists who, by necessity, work with physical evidence and physiological parameters. Third, there is a widespread trend in medicine of relying primarily on evidence-based data ignoring any

intuitive approach because less reliable. As a result, we have been paying great attention to external manifestation and less to what the patient has to express or communicate subliminally. A first sign of renewed interest in the hidden signals contained in patients' behavior has been a series of publications on the differences in linguistic expression between subjects with ES compared to PNES [24–26].

We undertook this experiment to force psychiatrists back in the diagnostic field and explore the observations they had to offer. We decided to challenge them with material ostensibly more suitable for epileptologists for the sake of comparing the two groups. More trials will be necessary using more appropriate material such as recorded patient's interviews, rather than, or in addition to, the events recorded on video. Though only tentative, some of the observations reported here should make us reflect on the opportunities we are missing. Psychiatrists, by training, are more attuned to capture the subtleties of human behaviour than neurologists and can contribute a new lexicon in defining PNES. Thus, they can play an important complementary role not only in establishing the diagnosis but also, by offering a glimpse onto the possible pathophysiological mechanisms of this disorder, paving the way to effective treatment. Thus, the issue is worth pursuing further by continuing the dialogue and fostering more active collaboration between epileptologists and psychiatrists in the management of patients with PNES. It is well known from the epilepsy literature that, so far, no single indicator has proved pathognomonic for the diagnosis of either ES or PNES. Rather, a constellation of signs or symptoms may be more indicative [12]. It appears that assessing the diagnostic weight of any single feature mentioned by the psychiatrists may be equally problematic. Our results indicate that certain observations can be misleading even for experienced psychiatrists. Signs must be interpreted carefully, in context, and gain significance if supported by additional evidence. In this respect, the convergence of multidisciplinary observations made by epileptologists in collaboration with psychiatrists should be ideal.

Given the high degree of discordance among psychiatrists in our study, it seems unlikely that, in the current state of medical practice, they may contribute much to diagnostic accuracy in a population that is already difficult to diagnose. However, greater familiarity with seizure-like events may enable them to add valuable diagnostic observations for screening patients with nonepileptic events. Conversely, after appropriate exposure and cross training, epileptologists may learn how to read into the symbolic meanings of body language and further refine their skills in the differential diagnosis.

This study has limitations. First, the number of raters who took part in the study is fairly small. This, in itself, can affect the results. Second, we tried to involve individuals with varying degree of seniority and diverse knowledge and experience about seizure disorders, who were representative of practicing psychiatrists. Thus, the participating psychiatrists may not reflect the background and experience of all psychiatrists in clinical practice in Italy and, perhaps even more important, in other countries. Most importantly, our finding that individual psychiatrists may be as accurate as individual epileptologists even without specific training must be interpreted with caution, keeping in mind that the level of expertize of the single participating raters is crutial. Clearly, the addition of one bad rater, or of one excellent rater, to either side could substantially change the accuracy ratio between the two groups. However, our results, though far from definite, provide insight in a fairly unexplored field and can be used as the background to stimulate new research.

Conflict of interest

Dr Beghi serves on the editorial boards of *Amyotrophic Lateral Sclerosis, Clinical Neurology & Neurosurgery,* and *Neuroepidemiology*; has been an associate editor of *Epilepsia*; has received money for board membership from VIROPHARMA and EISAI; has received funding for travel and speaker honoraria from UCB-Pharma, Sanofi-Aventis, GSK; has received funding for educational presentations from GSK; reports grants from the Italian Drug Agency and from the Italian Ministry of Health.

The remaining authors have nothing to disclose.

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