TITLE PAGE

Psychiatry versus General Physicians: Who is better at differentiating epileptic from psychogenic non-epileptic seizures?

Dr Tim S. MacDonald, Senior Psychiatry Registrar (Correspondence)

Adjunct Lecturer, Monash University, Melbourne, Australia

Department of Psychiatry, Alfred Health, Melbourne, Victoria, Australia

Email: tmacdonald@ausdoctors.net

Phone: (03) 90762000

Fax (03) 90762341

Aron Hill, Neuroscientist

Department of Neurology, Alfred Health, Melbourne, Victoria, Australia

A/Prof Thanh G Phan

Department of Neurosciences, Monash Medical Centre and Stroke and Aging Research Group, Department of Medicine, Southern Clinical School, Monash University, Melbourne, Australia.

Paul B. Fitzgerald, Professor of Psychiatry

Monash Alfred Psychiatric Research Centre, Alfred Hospital and Monash University Central Clinical School, Melbourne, Victoria, Australia

Dr Udaya Seneviratne, Epileptologist

Department of Neuroscience, Monash Medical Centre, & Department of Medicine, Southern Clinical School, Monash University, Melbourne, Australia.

ABSTRACT

Objective: To determine how accurately psychiatry and general medical doctors can differentiate epileptic and psychogenic non-epileptic seizures based on videotaped events (closest proxy to witnessed events). This study aims to establish how confidently this distinction can be made, the reasons why a particular diagnosis is reached, and inter-rater agreement.

Methods: 18 videos of patients demonstrating a heterogeneous mixture of epileptic and psychogenic non-epileptic seizures were collected, and ordered in a random mix. These videos were shown to groups of general physicians, medical registrars and residents (n=19), as well as psychiatrists and psychiatry registrars (n=8) who were provided with a questionnaire.

Results: A total of 27 doctors participated in the study. The overall percentage of correct diagnoses was 55.4%. There were no significant differences in correct diagnosis rates between psychiatry and general medical doctors. There was poor inter-rater agreement (Kappa = 0.159). Neither group was particularly confident in reaching a diagnosis, and diverse reasons underpinned the diagnoses given.

Conclusion: Among the participants, merely observing an epileptic or non-epileptic event is insufficient to establish a definitive diagnosis. The results indicate poor diagnostic accuracy and agreement among psychiatry and general medical doctors. This may have important implications on both education and clinical practice.

Key Words: psychogenic non-epileptic seizures; somatoform disorders; inter-rater reliability; video electroencephalogram; semiology.

Differentiating organic from psychogenic neurological symptoms is a clinical challenge facing doctors from a variety of disciplines, including psychiatry and general medicine. Disorders characterised by psychogenic non-epileptic seizures (PNES) often necessitate the gold standard investigation of video electroencephalography (VEEG) to distinguish from epileptic seizures. There are logistical barriers encountered in this process such as travel and waiting lists, and sometimes no events will be captured if the context is not conducive. PNES are paroxysmal episodes possibly facilitated by an unstable cognitive-emotional attention system.¹ During the episodes, sensorimotor and cognitive processes are modified or not properly integrated,¹ resulting in altered consciousness and motor movements without corresponding epileptic changes on the electroencephalogram (EEG). PNES are classically associated with a heterogeneous group of mental illnesses, including somatoform disorders, mood disorders, anxiety disorders and dissociative disorders.² It has also been proposed that a confluence of maladaptive personality traits (particularly those associated with Cluster B personality disorders, such as Borderline and Histrionic types) are associated with PNES.² Cluster B personality disorders are characterised by dramatic, emotional and erratic behaviour. Cluster B personality types and PNES may be linked by virtue of elevated rates of childhood sexual abuse being a common aetiological factor, so it is understandable that PNES may therefore be part of a constellation of trauma related disorders.³

In consultation-liaison (CL) psychiatry, referrals are often made for patients on general medical wards who are suspected of having PNES. Occasionally, the general medical doctors and/or CL psychiatry doctors may witness an event, and subsequently need to rely on their own eyewitness account for diagnostic reasoning. There have not been any studies examining the capacity of general physicians and psychiatrists to diagnose such events, nor the agreement between them. Seneviratne et al (2012)⁴ demonstrated there is a wide variety of diagnostic accuracy amongst other health professionals using visual diagnosis of events. In an earlier study, Seneviratne et al (2010) demonstrated that although there was an array of different specific motor manifestations (semiological features) of PNES, there was actually a remarkable degree of stereotypy (or predictability and consistency of those motor features) which could be used to aid diagnosis.⁵ Semiology is a descriptive study of signs and symptoms of seizures (lateralising and localising features of ictal and postictal stages). Also, Benbadis et al showed a moderate inter-rater agreement (Kappa 0.56) between neurologists when using VEEG⁶ despite their knowledge of semiology, which highlights the difficulties faced by clinicians in establishing the diagnosis.

The aim of this study was to investigate the diagnostic accuracy of psychiatrists and general medical physicians upon review of videotaped events (the closest proxy to witnessing) of epileptic seizures and PNES. We hypothesised that the following parameters would be low: inter-rater agreement, diagnostic accuracy, specificity, sensitivity and likelihood ratios. We also hypothesised that the groups would use diagnostic paradigms that they are accustomed to, for example psychiatry staff would use mental state features in preference to semiology.

METHODS

Materials and Procedure

18 videos of epileptic seizures (9) and PNES (9) were collated from the VEEG library at The Alfred Hospital. These events had previously been diagnosed by epileptologists who also had the aid of EEG as well as historical and examination parameters. The videos were arranged in a random mix without the EEG component. The cases included PNES, as well as complex-partial, tonic, and generalised tonic-clonic epileptic seizures from a variety of origins. The ethics approval was granted for this study by the Alfred Hospital Research and Ethics Committee. Participants were general medical doctors (5 general physicians, 7 general medical registrars and 7 general medical residents) and psychiatry doctors (4 consultants and 4 registrars) employed by Alfred Health.

Participants were required to complete a questionnaire (Figure 1) for each video that addressed the diagnosis made, how confident/certain they were in making that diagnosis, and reason in words why they chose that particular diagnosis.

Measures and Statistical Analysis

The following outcome measures were examined:

1. Are doctors able to distinguish between epileptic and non-epileptic seizures based entirely on video evidence? The percentage of correct diagnosis by each group was described.
2. Is there any difference between groups of doctors in terms of rates of correct diagnosis? Psychiatry and general medical staff were compared using an independent t-test, as were junior and senior medical staff. The percentage of correct diagnoses by individual groups of doctors (general physicians, medical registrars, medical residents, psychiatrists, psychiatry registrars) were compared using ANOVA.

3. What is the inter-rater agreement between general medical and psychiatry doctors if an event is witnessed? Inter-rater agreement was calculated using Fleiss' Kappa method.
4. What are the sensitivity, specificity, predictive values, and positive and negative likelihood ratios? Positive predictive value is used to predict the proportion of positive test results that reflect an underlying disease. The likelihood ratios were calculated using the sensitivity and specificity, and are preferable to predictive values because they assess the value of a diagnostic test if the prevalence of the conditions in the general population is unknown. A likelihood ratio helps to determine if a test result will change the probability of the disease being present or absent, and a score of <5 is not considered clinically significant.
5. How confident are doctors in committing to their diagnoses? The degrees of confidence of psychiatry and medical staff were compared using an independent t-test.
6. What are the characteristics of each case that underpins the diagnosis given (ie either semiological or mental state features)? Mental state examination parameters (in contrast to semiology) would be appearance, behaviour, speech and affect (eg age, gender, dress, surrounding onlookers or possessions, utterances, displayed emotional expression). The reasons underpinning the diagnoses were tabulated and also used descriptively.

The statistical package used was StatPages.org.

RESULTS

Graphical representation of the spread of number of correct answers (out of 18) is shown in Figure 2. The highest individual score was 15/18 by a psychiatry registrar.

Figure 3 shows the mean correct scores of individual groups of doctors across both specialties. There was no difference in accuracy between individual groups ($p=0.147$ based on ANOVA).

As demonstrated in Table 1, specificity and sensitivity are low in both groups. Positive likelihood ratios of both groups are less than 2, which means the post-test probability of accurate diagnosis is increased minimally ($<15\%$).⁷ Furthermore, negative likelihood ratio of the whole group is close to 1. Overall, these results indicate that seizure diagnosis is not robust among the participants.

There was no difference in correct diagnosis rate between the general medical doctors and the psychiatry doctors ($p=0.053$). There was also no significant difference in correct diagnosis rate when comparing junior doctors (registrars and residents) against consultants ($p=0.4514$). There was no significant difference in how confidently the diagnosis was made (general medical doctors 66.8% confident, psychiatry doctors 54.2% confident, $p=0.1$). One participant from psychiatry gave an outlier result of 0.1% confidence for one case – which may have been their attempt at spotlighting their lack of certainty in committing to a diagnosis. We were not expecting any participants to give extremely low, fractionalised answers.

The overall Kappa value was 0.159, indicating poor inter-rater agreement (1.0 being perfect, and between 0 and -1.0 as contradictory). Kappa was 0.18 for PNES and 0.098 for epileptic seizures.

General medical staff diagnosed using semiology more commonly than mental state features at a ratio of 15:1, compared to psychiatry with 4:1 preferring use of semiology. Both groups were more likely to have semiological reason underpinning the diagnosis, but the difference between these ratios was statistically significant ($p=0.0079$). This may indicate that when it comes to the use of mental state features, the psychiatry group preferred it only relatively more than general medicine did.

In terms of diagnostic reasoning, the percentage of non-responses ranged from 5.6% (general medical consultants) to 58.3% (psychiatry consultants). Up to half of semiological reasons given were incorrect. When semiological reasons were given for a diagnosis, ictal phenomena (as opposed to pre-ictal or post-ictal phenomena) were consistently the most frequent reasons given. Some examples of answers which were difficult to categorise included “too much”, “non-violent”, “poor effort” and “motor”.

DISCUSSION

This study was an attempt to explore the diagnostic accuracy of epileptic and PNES between psychiatry and general medical doctors. The findings of this study illustrate insufficient correct diagnosis rates, poor inter-rater agreement, and other statistical variables which indicate a lack of clinical diagnostic utility of relying on observation of a seizure in isolation. This also highlights the challenges faced by these groups of clinicians in the diagnosis of

such events. The differences between correct diagnoses amongst general medical staff and psychiatry staff were not statistically significant. The confidence clinicians displayed in committing to a diagnosis seemed commensurate with the chance of a correct diagnosis being made. There were a broad range of reasons underpinning the diagnoses. Even though semiology was preferred by both groups in order to arrive at the diagnosis, their understanding of distinguishing semiological features appears to be inadequate based on the reasoning provided by them.

There are a number of key diagnostic methods used when diagnosing PNES. With regards to semiological features, relative indicators of PNES are ictal eye closure, ictal and postictal hyperventilation, rhythmic tremor like movements, waxing and waning course, back arching, weeping, stuttering and abrupt onset and offset.^{5,8} Tongue biting is very rare in PNES. When it happens, usually the tip is bitten as opposed to the lateral edge bite seen in epileptic seizures. Other physical injuries and urinary incontinence are also less common in PNES.⁸ In addition, psychiatric assessment including mental state examination and formulation are useful to help hypothesise about the role of psychological factors in the genesis of PNES, and support that diagnosis with more evidence. Some relevant factors to explore in a psychiatric interview may include sick role modelling (eg by significant care-givers), and previous episodes of abnormal illness behaviour or medically unexplained symptoms. PNES can manifest across a broad age range, however, occurrence in the elderly population is unusual unless abnormal illness behaviour has been demonstrated previously. Importantly, a temporal association between a stressor or unmet needs, which may act as a nidus for somatisation, and onset of the PNES should be sought. Although recent and remote stressors may help to guide the diagnosis, they may be misleading (in a similar way to just observing a seizure) unless considered as part of the complete clinical scenario. Similarly, a history of epilepsy does not rule out PNES, as approximately 13% of patients with PNES have coexistent epilepsy.⁵ Investigations which are occasionally used include seizure provocation techniques, ictal SPECT and post-ictal prolactin assay in diagnosing epileptic seizures.⁹ The Minnesota Multiphasic Personality Inventory (MMPI) has also been used by some researchers⁹, however, its diagnostic value is doubtful.

There are a number of limitations to this study that may potentially override the validity of the findings. Low numbers of participants and cases, as well as disparity in numbers between psychiatric and general medical staff, may reduce the power of the study and obscure

significant but small differences between groups. A Likert-type scale may have been preferable to a percentage scale in determining how confident doctors were in committing to their diagnoses. The videos were chosen from a tertiary centre in a non-random manner, possibly introducing a bias. Some of the cases (e.g. those with complex partial semiology or frontal lobe origin) may have been particularly challenging and may not be representative of a random sample. The reason a variegated sample was chosen was to try to capture a good cross-section of presentations based on the experience of the neurology unit. If consecutive cases were gathered prospectively, then these cases may be subject to bias also (e.g. more urgent cases during particular times of the year). It is unclear how closely these cases reflect real practice, or if cases that have undergone VEEG have inherent selection bias. For example, they may have been diagnostic dilemmas already, or they may have only needed seizure classification for purposes of choosing an antiepileptic medication. In actual clinical practice the clinician is able to interact with the patient to extract more useful information to arrive at the diagnosis. Hence the accuracy of diagnosis made based on watching a video could be an underestimate.

Samuel and Duncan have previously conducted research on the utility of hand-held video cameras in differentiating seizure types, including PNES.¹⁰ They found that in a small proportion of cases, a confident diagnosis of PNES was made by neurologists based entirely on the videotaped evidence. In contrast, our study may indicate that confident diagnosis is less likely amongst non-neurologists.

There is no current literature comparing psychiatrists with other specialists in their ability to diagnose PNES. There is only one study comparing psychiatrists and neurologists in their opinion on how useful VEEG is.¹¹ The diagnosis of somatoform disorders has, however, had traditionally poor inter-rater agreement (Kappa -0.03)¹² amongst psychiatrists, possibly reflecting the heterogeneity of presentations and comorbidities present. Seneviratne et al (2010)⁵ demonstrated that there could potentially be 6 different stereotypic categories of PNES – this may help explain low inter-rater reliability found in this study due to vast heterogeneity of presentations, as well as highlight ways in which non-neurology doctors can improve their understanding of PNES semiology.

CONCLUSION

The diagnostic accuracy and inter-rater agreement were poor among the study participants. It would appear that observation of an event in isolation is a constricted approach to the diagnosis of PNES. It would seem that the participants were aware of the limitations of diagnosing, evidenced by the diagnostic humility in committing to diagnoses. Both general medical and psychiatry doctors preferred the use of seizure semiology to explain their diagnoses. Finally, this study raises the need for improved training of seizure diagnosis among clinicians.

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DISCLOSURE

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Figure 1

Epileptic vs Non-Epileptic Seizures: Inter-Rater Agreement

Specialty (please circle):
Psychiatry PGMU

Title (please circle):
Registrar Consultant

Tick one diagnosis

Write any percentage

Write brief reason in one column only

Video Number	Epileptic	Non-epileptic	Degree of confidence (percentage)	Semiology	Mental State Examination
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					

Figure 2

Figure 3

Table 1

Group	Sensitivity (CI)	Specificity (CI)	Positive Predictive Value (CI)	Positive Likelihood Ratio (CI)	Negative Likelihood Ratio (CI)
General Medicine (n=19)	0.44 (0.37- 0.52)	0.67 (0.60- 0.74)	0.58 (0.49- 0.66)	1.36 (1.03- 1.78)	0.83 (0.72- 0.95)
Psychiatry (n=8)	0.65 (0.57- 0.76)	0.60 (0.47- 0.71)	0.62 (0.50- 0.73)	1.62 (1.17- 2.25)	0.58 (0.42- 0.81)
Overall (n=27)	0.51 (0.44- 0.57)	0.65 (0.59- 0.71)	0.59 (0.52- 0.66)	1.45 (1.17- 1.79)	0.76 (0.66- 0.87)

CI, 95% confidence interval