# Neurologists can identify diagnostic linguistic features during routine seizure clinic interactions: results of a one-day teaching intervention

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ABSTRACT

The diagnostic distinction between epilepsy and psychogenic nonepileptic seizures (PNES) can be challenging. Previous studies have demonstrated that experts in conversation analysis can identify linguistic and interactional features in transcripts and recordings of interviews with patients that reliably distinguish between epilepsy and PNES. In this study, ten senior neurology trainees took part in a one-day intervention workshop about linguistic and interactional differences in the conversation behavior of patients with epilepsy and those with PNES. Participants were familiarized with a 12-item questionnaire designed to capture their conversational observations immediately after talking to a patient with seizures. After the intervention, 55 initial outpatient visits of patients referred to seizure clinics were video and audio recorded. All medical diagnoses were confirmed two years after initial presentation on the basis of a chart review (including MRI and EEG findings) by a fully trained epilepsy expert. Postvisit questionnaires relating to patients confirmed to have epilepsy (n = 20) or PNES (n = 13) were analyzed. Doctors' mean responses to 6 of the 12 questions about linguistic and interactional observations differed significantly between the groups with epilepsy and PNES. Receiver operating curve analysis showed that a summation scale based on items demonstrating significant between-group differences correctly classified 81.8% of patients as having epilepsy or PNES. This study shows that a brief Conversation Analytic teaching intervention can enable neurologists to identify linguistic and interactional features supporting the differentiation of epilepsy and PNES as they take their patients' history in routine seizure clinic consultations, potentially improving diagnostic accuracy.

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## 1. Introduction

### 1.1. Distinguishing between epilepsy and nonepileptic seizures

An epileptic seizure is a "transient occurrence of signs and/or symptoms due to abnormal excessive or synchronous neuronal activity in the brain" [1]. The manifestations of psychogenic nonepileptic seizures (PNES) resemble those of epileptic seizures [2], but PNES are not associated with epileptic cortical discharges. Instead, most PNES are considered as a nonwillful dissociative response to distressing internal or external stimuli [3]. In view of the phenomenological similarities between PNES and epilepsy [4], it is not surprising that this differential diagnosis represents a particular clinical challenge. Epilepsy tends to be overdiagnosed, and it typically takes several years before a correct diagnosis of PNES is made: over three-quarters of patients with PNES

are initially (and inappropriately) started on treatment for epilepsy [5]. The consequences of misdiagnosis may be far-reaching, particularly when patients with PNES are given ineffective emergency treatment for epilepsy with potentially serious side effects [6].

"Gold standard" diagnoses can only be made in patients in whom it is possible to carry out simultaneous recordings of behavior (with a video-camera), electrical brain activity (using electroencephalography, EEG), and heart rate (using electrocardiography, ECG) during habitual seizures [7]. However, such recordings are inaccessible for many and fail to capture attacks in about one-third of patients [8]. Even when seizures are captured during observation with video-EEG, health professionals need to establish that the recorded seizures were typical of events occurring at home. For all of these reasons, in clinical practice, the diagnosis relies heavily on the doctor's interpretation of the patient's history and witness accounts of events [9].

Although traditional medical teaching underlines the importance of factual details relating to seizure manifestations for the distinction of epileptic seizures and PNES, reports by patients or witnesses are often inaccurate and therefore, unhelpful [e.g., [10,11]]. Although comprehensive profiles of factual features capturing a wide range of patients'

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seizure subjective experiences by self-report questionnaire may correctly classify four out of five patients with epilepsy or PNES [12], yes/no questions about a more limited number of features are of doubtful diagnostic value. Further, single items traditionally thought by doctors to help distinguish between PNES and epilepsy (such as whether seizures have been observed from reported sleep) have been shown not to distinguish well between PNES and epilepsy [13]. Some observations (such as closed eyes during a convulsive seizure) differentiate well between epilepsy and PNES when video-EEG recordings are available but have little diagnostic value when they are only reported by witnesses or patients [10]. While the elicitation and interpretation of the patient's history thus remain the cornerstone of diagnosis, this process is fraught with difficulties.

### 1.2. Previous linguistic and interactional findings

A series of previous studies applied linguistic and interactional research methods to transcripts and video recordings of discussions between patients and doctors about seizures. In these encounters, clinicians used an unusually open history-taking approach, which allowed patients to describe their seizure experiences with little direction or interruption [14,15]. The analysis of the patients' descriptions, grounded in the qualitative methodology of Conversation Analysis (CA) [16–18], identified two contrasting conversational profiles which were closely linked to patients' medical diagnoses: whereas patients with epilepsy were likely to volunteer detailed talk about subjective seizure symptoms, patients with PNES tended to avoid symptom descriptions and to focus on the circumstances or consequences of their seizures [19]. In later studies, linguists were shown to be able to use these features of patients' conversational behavior accurately to predict a patient's medical diagnosis [20], with linguistic raters correctly predicting 85% of diagnoses subsequently confirmed by video-EEG. In contrast, only 40% of the working diagnoses formulated by the referring neurologists' prior to admission were supported by the video-EEG findings [20]. However, it has also been shown that the conversational features which the linguistic raters used to make their diagnostic predictions require doctors to adopt the unusually open style of questioning used in the original research studies. The traditional, more directive history-taking style routinely employed by neurologists in seizure clinics reduces patients' opportunities to exhibit the described diagnostic features [21].

### 1.3. Objectives

We have previously demonstrated that traditional history-taking characterized by a series of closed or category-constricted questions limits patients' ability to exhibit conversational features of potential diagnostic value [21]. However, we have also shown that it is possible to change the history-taking style of neurologists in routine seizure clinics and to increase the potential for the observation of diagnostically relevant aspects of patients' communication behavior with a one-day training intervention [22]. In the present study, we explored whether, following this intervention, doctors were able to detect some of the diagnostically relevant features in patients' talk which were identified more laboriously and post hoc by highly trained Conversation Analysts using detailed transcripts as well as the close review of video-recordings of the clinical interactions in earlier studies.

## 2. Method

This study was based on 55 recordings of interactions between ten neurology speciality registrars and patients obtained from specialist seizure outpatient clinics at the Royal Hallamshire Hospital in Sheffield and the General Infirmary at Leeds, between October 2012 and December 2013 after these senior neurology trainees had undergone a one-day-training intervention described previously [23].

### 2.1. Data

The data are a subset taken from a larger corpus of consultations which were recorded as part of a communication intervention study. Doctors' interactional activities were compared before and after the workshop, and a description of the whole pre- and postintervention data set is available elsewhere [22].

Patients' medical diagnoses were formulated two years after their enrollment in the study on the basis of a clinical record review by neurologists with a particular interest in seizure disorders. Medical diagnoses took account of the outcome of the clinical assessment by the neurology speciality registrar who saw the patient in the context of the study and who discussed each case with a fully-trained consultant neurologist subspecializing in the treatment of patients with seizure disorders at the time. The final medical diagnoses also took into consideration the results of investigations which took place at or after the initial outpatient clinic visit (such as EEG and MRI brain scans), in addition to considering the outcome of any therapeutic interventions.

Six cases were excluded because data were missing or incomplete, and a further 16 cases were excluded because the patients had received a diagnosis other than epilepsy or PNES, and previous linguistic findings have only been demonstrated within these two diagnostic categories. Thirteen of those excluded with other diagnoses were found to have experienced syncope, a condition which has previously been shown to be readily distinguishable from seizures (either epileptic or nonepileptic) with a short series of yes/no questions [12,24,25].

This study focused on the remaining 33 consultations. These consultations involved six of the ten doctors who had taken part in the training. The other four did not see any patients with these diagnoses in the posttraining phase of this project.

Ethical permission was granted by the NRES Committee Yorkshire & The Humber - Bradford Leeds, and all patients provided written informed consent.

### 2.2. Intervention

The one-day intervention workshop inspired by CA consisted of a range of presentations and interactive data sessions using video data recorded in the seizure clinic. The sessions began by introducing CA as a method, and then described previous findings on the differential diagnostic markers. Finally, a new approach to asking questions aiming to optimize patients' opportunity to demonstrate the previously described interactional and linguistic diagnostic features was introduced [for a more detailed description of the intervention see [22,23]. In the final session of the workshop, participants were familiarized with a scoring questionnaire for conversational phenomena, which they were asked to complete immediately after each encounter recorded in the subsequent part of our study (see Section 2.3).

The workshop was delivered once in Sheffield and once in Leeds to ensure the ten doctors at both sites could participate. One of the ten doctors was unable to attend either session in person and viewed video-recordings of the workshop sessions.

### 2.3. Linguistic features questionnaire

Based on the 17-item Diagnostic Scoring Aid (DSA) developed previously to guide the post hoc analysis of transcripts and video-recordings of doctor–patient encounters by conversation analysts [20], we developed a much simpler questionnaire designed to guide doctors to reflect on interactional and linguistic features immediately after a clinical encounter with a patient first presenting with seizures for their first appointment.

Our postinterview interactional observation questionnaire included a total of 12 conversational observations focusing on interactional phenomena, reflective items (how the consultation had made the doctor feel), and items relating to the conversational contributions of third