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Conversation analysis can help to distinguish between epilepsy and non-epileptic seizure disorders: A case comparison

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ABSTRACT

Purpose: Factual items in patients' histories are of limited discriminating value in the differential diagnosis of epilepsy and non-epileptic seizures (NES). A number of studies using a transcript-based sociolinguistic research method inspired by Conversation Analysis (CA) suggest that it is helpful to focus on how patients talk. Previous reports communicated these findings by using particularly clear examples of diagnostically relevant interactional, linguistic and topical features from different patients. They did not discuss the sequential display of different features although this is crucially important from a conversation analytic point of view. This case comparison aims to show clinicians how the discriminating features are displayed by individual patients over the course of a clinical encounter.
Methods: CA-inspired brief sequential analysis of two first 30-min doctor–patient encounters by a linguist blinded to all medical information. A gold standard diagnosis was made by the recording of a typical seizure with video-EEG.
Results: The patient with epilepsy volunteered detailed first person accounts of seizures. The NES patient exhibited resistance to focusing on individual seizure episodes and only provided a detailed seizure description after repeated prompting towards the end of the interview. Although both patients also displayed some linguistic features favouring the alternative diagnosis, the linguist's final diagnostic hypothesis matched the diagnosis made by video-EEG in both cases.
Conclusion: This study illustrates the importance of the time point at which patients share information with the doctor. It supports the notion that close attention to how patients communicate can help in the differential diagnosis of seizures.

While neuroimaging technology and access to video-EEG monitoring have improved dramatically, the interaction between doctor and patient is still the most important tool in the differential diagnosis of seizures.[1,2] In many cases doctors have to diagnose seizure disorders on the basis of the patient's history alone because interictal tests are not sufficiently specific, or because they have limited access to ictal monitoring. It may not be feasible to make "gold standard" diagnoses by recording typical seizures with video-EEG: even when patients are admitted for monitoring 23–47% fail to have a seizure during the observation period.[3,4] History taking is also crucial for the 10–30% of patients with NES who have additional epileptic seizures.[5] Given that the act of taking the history is so important, it is surprising how little attention researchers have paid to this particular communication.

Whereas epilepsy and fainting or epilepsy and sleep disorders can be distinguished reliably on the basis of symptom clusters,[6–8] the differentiation of epilepsy and NES seems more challenging. Several recent studies have shown that, at least in isolation, symptoms traditionally used by doctors to inform the diagnosis, such as the presence or absence of ictal injury, or the onset of seizures during sleep, have no predictive value.[9–11] One study in which two epileptologists (who were unaware of any other clinical information) were asked to rate detailed written seizure descriptions from patients with temporal lobe epilepsy or non-epileptic seizures found that the sensitivity of this approach for the detection of epileptic seizures was 96% although the specificity was only 50%.[12] Not surprisingly, misdiagnosis rates in less expert settings are high, ranging from 5 to 50%.[3,13–15]

A number of studies have examined the diagnostic potential of "parafactual" features (interactional, topical and linguistic char-

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Table 1
Summary of the most important interactional, topical and linguistic differential diagnostic features[21]

Feature	Epilepsy	NES	Source
Subjective seizure symptoms	Typically volunteered, discussed in detail	Avoided; discussed sparingly	17,21
Formulation work (e.g. formulation attempts)	Extensive, large amount of detail	Practically absent, very little detailing efforts	16,20,21,40
Seizures as a topic	Self-initiated	Initiated by interviewer	17,21
Focus on seizure description	Easy	Difficult or impossible (“focusing resistance”)	17,21
Spontaneous reference to attempted seizure suppression	Often made	Rarely made	41
Seizure description by negation	Rarely (negation is usually explained and contextualized)	Common and absolute (e.g. “I feel nothing”, “I do not know anything has happened”)	21,41
Description of periods of reduced consciousness or self-control	Intensive formulation work	“Holistic” description of unconsciousness” “I know nothing”	18,21
	Aiming at a precise, detailed description	Naming of unconsciousness without differentiation or description	
	Attempts to fill gap in level of consciousness	Pointing out inability to remember anything or take in anything	
	Precise placement of period of lost consciousness in the seizure process	No self-initiated detailed description	
	Display of willingness to know what precisely happened during periods of unconsciousness	Presentation of gaps as most dominant element of the disorder	
	Degree of unconsciousness can be challenged interactively.	Completeness of unconsciousness cannot be challenged	
Metaphors, conceptualization of seizures	Seizures presented as an external independent, threatening entity	No clear coherent concept	19,42
	Active struggle against seizure-threat, e.g. metaphors describing a fight	No definite external genesis	
		No description of active struggle against seizures	

acteristics of talk about seizures) and developed a clinical interview procedure which allows doctors to elicit these features.[16–21] Based on over 100 different clinical encounters and using a linguistic method derived from Conversation Analysis, a number of non-factual features have been identified which cluster with the diagnoses of epilepsy or NES in a non-random fashion (Table 1).[20] In a previous study, a linguist blinded to clinical data correctly predicted the diagnosis of epilepsy or NES (as proven by video-EEG) in all of eleven patients admitted because consultant neurologists were uncertain of the diagnosis.[21]

Previous reports used particularly clear, brief transcript fragments from a range of patients to illustrate the distinguishing features. In this paper we take a different approach. We present a comparison of two patients with apparently similar seizures. Both describe attacks occurring without warning and often from sleep, which were considered as generalized tonic clonic seizures on the basis of witness accounts. Both patients continued to have seizures whilst taking antiepileptic drugs and were admitted for video-electroencephalographic (EEG) monitoring because the treating neurologist eventually decided that they were more likely to have NES. One patient proved to have epileptic seizures, the other NES. Whilst larger prospective studies must prove that the linguistic techniques used here increase diagnostic accuracy, this case comparison more clearly reflects the reality which doctors face when they make diagnostic decisions in the clinic room.

Method

Patients

The two interviews were conducted by a neurologist (MR) in the Department of Neurology at the Royal Hallamshire Hospital in Sheffield in 2005/2006 whilst the patients had been admitted for 48 h of video-EEG observation. Although the neurologist was unaware of the video-EEG diagnosis at the time of the interview, both diagnoses were subsequently confirmed by the recording of a typical attack. The two patients presented here were chosen from a pool of over 20 patients, all of whom were admitted for video-EEG examination because the admitting neurologists were uncertain of the nature of their seizures. The patients were not chosen randomly for this illustrative case comparison, but because their factual seizure histories were similar and the diagnosis therefore particularly challenging. The patients were chosen after the linguist had completed his analysis. The research was approved by the South Sheffield Research Ethics Committee. All patients gave written informed consent.

Interview method

The presented findings strongly depend on the way the doctor conducts the conversation with the patient. We have previously described a semi-standardized interview procedure which maximizes the opportunity for doctors to elicit the distinguishing linguistic features and facilitates comparison of different patients' responses to the same communication challenges.[21] The communication outline allows the patient to develop their own communicative agenda and encourages the doctor to register the information the patient volunteers (see Table 2). The most significant differences from “traditional” history taking are that the doctor is encouraged not to interrupt the patient or introduce new topics into the consultation. In a routine clinical encounter further questions (for instance relating to the treatment, previous medical or family history) would have to be added to the open interview procedure described.

Analytic method

Verbatim transcripts of the conversations between the patients and the neurologist were analyzed by a linguist (LP) blinded to all medical data including the result of the video-EEG monitoring. The linguist was asked to decide whether patients were likely to describe epilepsy or NES on the basis of the previously described criteria summarized in Table 1. His analysis was based on the sociolinguistic approach of Conversation Analysis (CA).

Table 2
Interview procedure

Interview phase	Inquiries	Approximate duration
'Open' phase	What were your expectations when you came to hospital?	10 min
Elicited seizure episode accounts	Can you tell me about the first seizure you can remember? Can you tell me about the last seizure you can remember? Can you tell me about the worst seizure you can remember?	10 min
'Challenge' phase	Inquiry or inquiries challenging the patient's description	5 min
Doctor's instructions Avoid introducing new topics Tolerate silence Use continuers (*mmm*, *right*, etc.) to indicate continued attention Repeat what the patient has said to encourage elaboration		

CA is a qualitative micro-analytical approach to the study of human interaction, which aims to discover how everyday conversations are organized by close observation of recorded instances.[22–25] The basic CA method was outlined by Harvey Sacks in his influential 'Lectures on Conversation'.[26] Sacks stated that CA explicates the forms and functions of utterances that accomplish activities such as giving or seeking advice or complaining. The main analytic focus is on the meaning and function which the interactants themselves ascribe to each other's contributions in an ongoing interaction. CA highlights the fact that interaction proceeds sequentially: interactants relate their conversational moves to the preceding context, and at the same time their contributions make specific next moves expectable or relevant.[27] As such, interactants co-construct an encounter as it unfolds, and the function of an individual utterance must be stated in terms of what it responds to and what response it invites.[28,29]

CA transcripts generally contain details of pauses, intonational contours and non-verbal communication. Much of this information has been removed from the fragments presented here to improve readability. Only pauses of 1 s or longer are marked (between brackets). The figures in square brackets denote the timing the extracts in the interview [min:s].

Results

'Open' phase

Patients with epilepsy tend to volunteer information about individual seizure episodes and seizure symptoms easily when faced with the open initial communication challenge posed by the doctor (making no reference to seizures). They are prepared to expend formulation effort to convey to the doctor what it feels like to have a seizure. Patients with NES on the other hand tend to talk about other topics and need more overt direction before describing seizure symptoms.[20,21]

[1] Barbara [00:31–00:50]

B: I got to the stage where I was found, in the middle of winter, seven miles from home, because I was on that much different medication. I'd walked out of home in the middle of the night, down country lanes, and I, I was found seven miles from home. So basically they took me off the medication and this is the next – to try and see what's causing the seizures

Barbara: Barbara's response to the initial inquiry is that she is not optimistic about the potential of the video-EEG monitoring to help. This brings her onto her past experience with medication. At this early stage in the conversation she volunteers an account, which could be understood as a seizure description:

However, Barbara does not present this event as a *seizure*: rather, she attributes her wandering to the fact that she was heavily medicated. In fact, further accounts of this episode later in the interview make it clear that she does not consider the event as seizure-related. In any case, Barbara's description contains little details relating to her subjective experience. In the remainder of the 'open' phase Barbara also fails to volunteer any accounts of memorable seizure episodes or descriptions of seizure symptoms, despite attempts by the doctor to move the focus to the nature of her seizures. For example, in [2] and [3] the doctor picks up on the fact that Barbara has implied that she improved when her medication was reduced.

[2] Barbara [05:29–05:46]

D: So you've been better have you?
B: No not really, though there was a a while where I was sort of not too bad when they'd got me on the pills, I was on a – I went a couple of years where they weren't too bad but I've never really been (1.2) seizure-free.

[3] Barbara [06.30–6.56]

D: You said you didn't f- quite feel your same – er, yourself when you were on the tablets.
B: No. Even though the fits were better,
D: Mmm?
B: I was sort of (1.2) I was in another world. I was like a zombie. So obviously the pills helped the seizures, but they left me z-like a zombie. I didn't know whether I was coming or going. So even though the pills helped the seizures I was a lot worse in other ways.

Although Barbara talks about her seizures she does not describe what her seizures are actually like until she is more firmly directed to this topic later in the encounter.

Jack: Jack initially discusses his general hopes of the outcome of the test period. He elaborates on recent traumatic events that he thinks may have caused him to have more seizures than before, and on his prior medical history. At this point he volunteers this account:

[4] Jack [03:32–04:00]

J: I didn't realize what the illness was all about at the time. As a matter of fact I woke up one morning and found I was lying on the floor, and there were two ambula- two ambulance men

there, my next door neighbors, my wife, looking ghasted at me and everything. (1.0) Uh, I had about eight people in the house looking at me because I'd fallen off the bed.
D: Mmm.
J: But they didn't, uh describe it as epilepsy until after some more attacks, six months afterwards.

Jack refers to this episode explicitly as his first "attack". He volunteers this account of a seizure episode. Moreover, Jack formulates the account in terms of his experience at the time: for example, he remembers his wife and others "looking ghasted at me".

Whilst this first account of a seizure episode does not provide a great deal of factual information about his seizure experience, Jack subsequently maintains the focus on his seizure experiences. With occasional minor prompting by the doctor Jack adds to the description of his seizures. He provides several additional accounts of seizure episodes describing his experience in more detail. For example, he refers to "waking up" and "going back to sleep" in the description of a particular seizure. When the doctor prompts for clarification, Jack offers a precise description of another seizure symptom:

[5] Jack [08:20–08:49]

D: Is that what it feels like to you, like going to sleep? (1.9)
J: Yes [...] I have a slight headache as well afterwards. Like yesterday and the day before I h- I had a slight pain like across the top of my he- head here *(points to his head)* and it felt very, you know, and (1.9) it didn't feel (1.6) uh very hurting, but uh I could feel like a heaviness on the top of my HEAD;

Notice that Jack describes his headache in considerable detail, specifying what type of "pain" was involved: not a "very hurting" pain, but a "heaviness on the top of my head". He perseveres with the description despite apparent difficulty: for example the long pauses in "and it felt very, you know, and (1.9) it didn't feel (1.6) uh very hurting" suggest that Jack is trying hard to communicate his experience as precisely as possible.

Elicited seizure episodes

During the next phase of the interview, the doctor directs the patient's attention to three particular seizure episodes. Patients with epilepsy typically focus easily on the seizure episodes and provide coherent, structured accounts of seizure episodes based on their own recollections or additional information from witnesses. Patients with NES seem to resist the focus on particular episodes, offering negative and holistic statements such as 'I never remember anything about my seizures'. They typically provide more information about the circumstances in which the seizures took place or their consequences, rather than what they can remember *feeling* at the time of the seizure.[20,21]

Barbara: Fragment [6] shows Barbara's response to the doctor's first seizure prompt.

[6] Barbara [06:28–06:54]

D: Can I take you back to the first seizure you've had
B: That's a very long time ago. Like I say I was five and a half month pregnant (1.0) and (1.2) the first thing I remember was the doctor being there, because my husband had rang the doctor because I had (1.0) collapsed and (2.2) like I say I don't really have any recollection of what happens. I were just, bang, that's it I'm gone.

Barbara claims that she can only remember "the doctor being there" after she had "collapsed". She does not go into detail about the circumstances in which the seizure took place and, most importantly, does not attempt to describe how she felt when she lost or regained consciousness, how long she may have been unconscious, or what she may have done while she was unconscious. She generalizes away from her first seizure account quickly, shifting from past tense to present tense narration with "I don't really have any recollection of what happens".

Barbara's account of her last seizure is also brief:

[7] Barbara [08:33–08:51]

D: What about the last one you've had? (1.0)
B: Last night.
D: Mmm?
B: More or less the same thing. I was on the bed watching TV. I've had a seizure, I've come round, I can't hear. That's it, and then I just carry on with life as normal. (1.2) I just sort of wake up, (1.6) takes me a few minutes to sort of get me bearings, and (1.2) and then that's it.

Again, Barbara generalizes away from the individual episode very quickly: immediately after "I was on the bed watching TV" she switches from past to present tense to revisit her earlier description of a typical seizure. She mentions only one of the seizure symptoms she has already described ("I can't hear"), referring to the other two indirectly with "takes me a few minutes to sort of get me bearings".

These observations reveal that Barbara exhibits resistance to focusing on individual seizure episodes. This is particularly evident in her response to the doctor's 'worst seizure' inquiry:

[8] Barbara [09:42–10:04]

D: What about the worst seizure you've ever had?
B: I've had a few. I've had them in the bath, where I've nearly drowned. I've been caught out on the stairs by the fire brigade, because I've come down the stairs and my leg's actually gone and wrapped through the banister thing, and the fire brigade have had to come and saw the s- and get the, cut me out the stairs. I've had them while I'm cooking. I've had them in the middle of the road. So I've had a few where it's been quite dangerous.

Here Barbara does not describe a single seizure. Instead, she lists multiple seizure episodes without going into detail about her experience of any of them. She subsequently elaborates on how much embarrassment her disorder causes her, and how she feels excluded from society. She does not return to the topic of her seizure experience until the doctor explicitly directs her attention to it.

Jack: As indicated above, Jack has already provided an account of his first seizure episode in the 'open' phase of the conversation (fragment [4]). When the doctor asks him to revisit the episode Jack elaborates the initial account: compare fragments [4] and [10].

[9] Jack [10:34–11:16]
J: I felt quite good. I went to bed feeling tired (1.5) and that was all. (1.0) And then I woke up about, uh, midnight, between midnight and one o'clock in the morning, and just

saw all these faces: the ambulance men, the (1.3) neighbors, just uh looking at me, and my wife looking quite (1.0) er harassed. And uh, I'd hit my face on the side of the cupboard, (1.3) and it was sore and all red. (1.2) And that's all I remember. I was taken to the hospital in the ambulance, (1.3) and, I can't really remember because that was in nineteen seventy three.

Notice that Jack adds a description of his mental and physical state before the seizure, an indication of the time when he regained consciousness, a partial reconstruction of what had happened during the seizure, and information on what happened after he regained consciousness. Jack concludes the account with the claim that he does not remember much, but he has clearly made an effort to tell the doctor what he *can* remember.

Jack's subsequent accounts of his last and worst seizure episodes do not add much to what he has already told the doctor about his seizure symptoms. Nevertheless, in comparison with Barbara's, Jack's accounts are more elaborate, with more overt reliance on what he can remember of the experience. His account of his last seizure illustrates this:

[10] Jack [12:41–13:16]

D: It might be easier to remember uh uh uh more about the last seizure you had, (1.9) you've experienced.
J: Now that's, uh, like I said this last seizure I ha- I don't really remem- I remember getting up and going uh (1.9) I think I was going to the – either there, or i'm standing there, to get some water, and all of a sudden I just wal- I, I was sitting down. And I saw my wife looking at me, and I realized then that I'd had a seizure. I didn't actually feel it when I was there, but then I came back there and I saw her looking at me and I knew I'd had a seizure then. I didn't feel any chain reaction inside or anything, (0.4) but I knew I felt light, I knew my, my head felt light, and it didn't feel right.

Here Jack starts to say "I don't really remember", but leaves this negative statement incomplete in favor of an attempt to reconstruct, with some apparent difficulty, what he *does* remember of the episode. He describes his realization that he had had a seizure from his wife's reaction. Although he first suggests that he did not experience any other symptoms ("I didn't feel any chain reaction inside or anything"), he recalls feeling lightheaded. Moreover, when encouraged by the doctor to elaborate on his experience of lightheadedness, Jack provides a more precise description, given in [12].

[11] Jack [16:13–16:30]

J: I could understand what people were saying but I couldn't respond to them. My head felt a bit, uhm, I don't know if you could call it lightheaded or woozy or (1.5) or well, but I couldn't concentrate and just couldn't (1.0) adjust the, the words together and the subjects.

To summarize, Jack shows no 'focusing resistance' and adds several details to the description of his seizure experience in this part of the interview.

Response to 'challenge'

In the next part of the interview schedule, the doctor formulates an inquiry that invites the patient to reconsider an aspect of the description so far. The doctor can do this by introducing a symptom and asking whether the patient has ever experienced this, or by asking the patient to confirm or disconfirm a prior statement. Patients with epilepsy typically respond to this inquiry by revising or elaborating their description, while patients with NES often display a reluctance to do so.[20,21]

Barbara: In Barbara's case, the doctor's 'challenge' is an inquiry, which the doctor overtly relates to Barbara's previous statement that she often cannot *hear* when she regains consciousness after a seizure. Given Barbara's briefness on the subject of her seizure experience so far, her response to this inquiry in the final stage of the interview is remarkably elaborate:

[12] Barbara [13:58–15:01]

D: You said after the seizures you lie there and you can't hear.
B: No, it takes –
D: So is there a state (1.0) when you – but when you're out you're completely out. Is there a state when when you can uh see what's going on but you can't react to people?
B: Yeah that's when I come round. When I first come round I sort of, I can see them and I know they're there, and I can see their mouths moving, but I just can't hear a thing they're saying to me, and I'm sort of just looking at them, as if to say, y'know, 'what are you –'. I can't, I just can't, it's like everything's in slow motion. I can't sort of respond because I don't kno:w what they're trying to say to me. I'm sort of looking at them as if to say, y'know, 'what?' (1.4) because I just can't sort of – like I say my coordination's really slow. I can't (1.0) y'know, y'know when I wipe my mouth, because I f- froth at the mouth, it's sort of like, y'know, like this, *(imitates wiping mouth)* sort of really really slow, because I can't sort of grasp – (1.0) I know what I want to do but the hand seems to be in slow motion, and the same with everything around me. When I first come round it's like everybody's wh- moving around in slow motion, that's what it seems like. And then I, I just can't hear anything they say.

Barbara provides a precise description of her perception of herself and people around her when she regains consciousness after a seizure. Notice that she refers to a seizure symptom–frothing at the mouth – which she has not mentioned so far. The many hesitations, repetitions and restarts suggest that Barbara is attempting to produce an accurate description of her state during this part of the seizure experience, although the content of her narrative is rather repetitive.

Jack: In Jack's case, the doctor's 'challenge' is a request to confirm an inference that can be drawn from Jack's prior description – namely, that except for some of his early seizures, his loss of consciousness during seizures is complete. Jack's response is minimal:

[13] Jack [17:22–17:41]

D: And uh uh uh, in – so in your blackouts you are completely uh out.–
J: Out, yes.
D: You cannot remember what's happened apart from years ago.
J: Apart – years, yes.
(1.6)

Yes, that's co- that's true.
(3.4)
Mmm. So,
(3.4)
D: Mmm.

Jack briefly confirms the doctor's formulation, and does not use the opportunity to repeat or revise his description, despite the long pauses. To summarize, while Barbara elaborates considerably in this phase of the conversation, Jack adds nothing to his prior description of his seizure experience.

Differential diagnosis

Table 1 shows that, in our interviews, patients with epilepsy tend to focus on their seizure experience without prompting from the doctor, while patients with NES typically require direction to do so. Barbara does not begin to talk about her own seizure experience until the doctor has asked her to describe her first seizure. In the 'open' phase of the conversation, Barbara's focus is on other topics. Jack self-directs the conversation to his seizure experience, and provides the doctor with information about individual seizure episodes and subjective seizure symptoms before the doctor elicits such accounts. In this respect, then, Jack behaves as we would expect from a patient with epilepsy, while Barbara's communication behavior is typical of patients with NES (Table 3).

Barbara's shows resistance to focusing on individual seizure episodes. She does not volunteer any descriptions of particular seizures and she either generalizes quickly or provides a list of brief references to episodes, rather than a single coherent account in response to the doctor's inquiries. She only mentions subjective symptoms briefly, and uses holistic and negative statements, such as "I don't really have any recollection of what happens" and "bang, that's it I'm gone" (fragment (6)). In this respect her communication behavior is typical of NES patients. Only when 'challenged' by the doctor at the end of the interview, does she produce "formulation effort" more suggestive of the communication style of patients with epilepsy. Jack's behavior is the exact opposite of Barbara's. His description of seizure symptoms (in terms of detail, formulation effort, and the fact that he *volunteers* the information) is typical of patients with epilepsy. He relies on his own recollections to formulate coherent, chronological accounts of the events. Only his minimal response to the doctor's 'challenge' would be more typical of a patient with NES.

In summary, Barbara behaves as we would expect from a patient with NES in all respects except her response to the doctor's 'challenge'. Jack behaves as we would expect from a patient with epilepsy with the same exception. Given that the patient's behavior during the 'open' phase is of the greatest differential diagnostic significance, the linguist formulated the hypothesis that Barbara has NES whereas Jack has epilepsy. These hypotheses corresponded with the diagnoses confirmed by video-EEG (Table 3).

Discussion

This paper illustrates how a procedure for 'taking the history' which gives patients an unusual amount of control over the course of their encounter with the doctor, and an analytic method which pays particular attention to interactional, topical and linguistic features rather than factual content can make an important contribution to the clinical distinction of epilepsy and NES.

We should emphasize that the interview procedure and analysis method are intimately connected. The comparison of the doctor's conversation with Barbara and Jack shows how crucial the extent is to which patients *volunteer* a focus on the seizure experience and the description of subjective seizure symptoms. It would be impossible to assess this feature in a conventional, fact-oriented consultation in which patients are typically interrupted by the doctor after seconds.[30] In this type of interaction it is invariably the *doctor* who determines the topical trajectory of the consultation. Assessing interactional features requires a procedure that allows the patient to set the agenda, at least in the opening phase of the consultation. In this sense our study contributes to the literature that promotes an open, 'patient-oriented' interview style in medical consultations,[31,32] and which is intended to convince doctors to change their history-taking technique.[33] While previous research has shown that such a style leaves patients more satisfied that the doctor has addressed all of their concerns,[29] our study shows that giving patients room to develop their own agenda can yield information of diagnostic and – potentially – therapeutic value. Barbara's display of "focusing resistance" for instance, could be an interactional reflection of an escape/avoidant coping style which is a key psychopathological feature of NES[34,35] and can represent an obstacle to engagement in psychotherapeutic intervention.[36] This resistance may reflect the dissociation of traumatic experiences or an "unspeakable dilemma" which commonly cause NES.[37,38] In contrast, Jack's attempts to reconstruct his seizure experience as best as possible for the doctor could be interpreted as "planful problem-focused coping".[39] This coping style indicates that Jack would be likely to accept the doctor's therapeutic suggestions and integrate them into his own treatment approach to his seizure disorder.

Table 3
Case comparison—summary of findings

	Barbara	Jack
'Open' phase	No focus on seizure experience	Volunteered focus on seizure experience and volunteered accounts of individual seizure episodes
Interpretation	Typical of NES	Typical of epilepsy
Elicited seizure accounts	Minimal accounts of individual seizure episodes, resistance to focusing on individual episodes, brief descriptions of subjective seizure symptoms	Coherent accounts of individual seizure episodes, detailed description of subjective seizure symptoms
Interpretation	Typical of NES	Typical of epilepsy
Response to 'challenge'	Considerable elaboration on prior description of prior subjective seizure symptoms	No elaboration on description of subjective seizure symptoms
Interpretation	Typical of epilepsy	Typical of NES
Final linguistic hypothesis	NES	Epilepsy
Final medical diagnosis (video-EEG confirmed)	NES	Epilepsy

We should point out that the method demonstrated here does not lend itself easily to 'box-ticking'. It involves not only assessing whether or not the patient provides certain items of information, but also in what precise context and in what sequence. What is more, the method identifies situations in which patients pass the opportunity to share particular information with the doctor. Ignoring the local context of a particular interactional turn would have serious consequences for the accuracy of the linguistic ''diagnosis''. For example, if we compared Barbara's description of seizure symptoms in [12] with any of Jack's descriptions in the context of his accounts of individual seizure episodes (for example [9] and [10]), we might well conclude that Barbara offers more detail with more formulation effort. One might therefore decide that Barbara was more likely to have epilepsy, and Jack NES. However, what matters crucially is that Barbara's description comes after explicit prompting, late in the conversation, and after she has passed on various opportunities to direct the focus of the conversation to her seizure experience. Jack's apparently less elaborate prompted descriptions, on the other hand, add to information he has already provided voluntarily in the 'open' phase of the conversation. It is important, then, to see any content of the patient's descriptions in the sequential context of the conversation as a whole. In practical terms this means that the conversations need to be analyzed systematically from beginning to end.

Although the linguistic features described here have been studied in more than 150 patients with epilepsy and NES in Germany and the UK, larger prospective studies should confirm the promising diagnostic potential observed in studies in which linguists were aware of the medical diagnosis of the patient. Larger studies will also need to determine how robust the linguistic observations are in the presence of significant co-morbidity, for instance depression or anxiety in patients with epilepsy. What is more, future studies will need to determine to what extent the linguistic features can be observed by doctors as they speak to patients and without detailed post-hoc analysis. Based on our own experience in clinical practice and with the communication of our findings in clinical seminars, we suspect that doctors can learn to become more receptive for many of the observations described here (such as the extend to which subjective seizure accounts are volunteered). It is likely that other linguistic features which may help in the differential diagnosis (such as the consistency of metaphoric conceptualizations) will always require verbatim transcripts and post-hoc analysis.

Whilst we do not suggest that doctors should ignore the factual content of their patients seizure histories, this study provides further evidence demonstrating how useful it can be to pay attention to how patients share information—even if their communication profile is not consistent solely with either epilepsy or NES.

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