

Quantifying qualitative observations in patients' talk to aid the differential diagnosis of transient loss of consciousness

Laura Jenkins / Markus Reuber

English Abstract

Clinicians making medical diagnoses explaining presentations with transient loss of consciousness are faced with the complex task of having to distinguish between epileptic and (dissociative) non-epileptic seizures and rely heavily on patients' verbal accounts in this process. In this paper we summarise a series of four studies using different techniques to analyse talk between 21 patients with seizures and a neurologist, with the aim of describing conversational profiles typically associated with a medical diagnosis of epilepsy or nonepileptic seizures. The methods employed included conversation analysis, metaphor analysis and content analysis. This summary focuses on the way in which these qualitative methods had to be adapted in order to contribute to the diagnostic process and how quantitative methods were used to explore the differential diagnostic potential of the qualitative findings. In our discussion we consider some of the challenges of combining qualitative and quantitative approaches to talk-in-interaction, whilst recognizing the remarkable benefits the combination of these approaches has for clinical practice.

Keywords: Epilepsy – Non-epileptic seizures – Conversation Analysis – Doctor-patient communication – improving diagnosis – quantification.

German Abstract

Für Kliniker, zu deren Aufgaben die Differentialdiagnose des transienten Bewusstseinsverlusts gehört, ist die Unterscheidung von epileptischen und (dissoziativen) nicht-epileptischen Anfällen eine besondere Herausforderung, bei der sie sehr auf die verbal vermittelten Erfahrungen des Patienten angewiesen sind. In diesem Artikel fassen wir vier Studien zusammen, die sich verschiedener wissenschaftlicher Untersuchungsmethoden bedienen, um in Gesprächen zwischen 21 Patienten mit Anfällen und einem Neurologen das typische Konversationsverhalten von Patienten mit Epilepsie einerseits und von Patienten mit nichtepileptischen Anfällen andererseits zu beschreiben. Zu den Methoden, die dabei zur Verwendung kamen, zählten Konversationsanalyse, Metaphernanalyse und Inhaltsanalyse. In dieser Zusammenfassung geht es vor allem um die Art und Weise, in der diese qualitativen Untersuchungsmethoden angepasst werden mussten, um einen Beitrag zum klinischen Diagnoseprozess leisten zu können und wie sie mit quantitativen Methoden kombiniert wurden, um das differentialdiagnostische Potenzial der qualitativen Ergebnisse zu realisieren. Während unsere Zusammenfassung keinen Zweifel am erstaunlichen Potential der Kombination qualitativer und quantitativer Untersuchungsmethoden zur interaktionalen Gesprächsanalyse zulässt, diskutieren wir am Ende dieses Artikels die Herausforderungen, die sich stellen, wenn qualitative mit quantitativen Methoden kombiniert werden.

Keywords: Epilepsie – nichtepileptische Anfälle – Konversationsanalyse – Arzt-Patienten-Kommunikation – Diagnose – Quantifizierung.

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1. Conversation Analysis and Quantification

There is a rich history of mixing methods of both data collection and analysis, with fierce debate over definitions and theoretical paradigms (for example Burke/Johnson/Onwuegbuzie/Turner 2007; Denzin 2012). In this paper we describe four studies using different approaches (Conversation Analysis (CA), metaphor analysis and content analysis) to the analysis of conversations between a doctor and patients with seizures in a clinical setting. All of these studies aimed to test the contribution linguistic analysis could make to the differential diagnosis of epileptic and (dissociative) nonepileptic seizures disorders. Although the studies differ in their use of analytic methods, all use statistical approaches to explore the qualitative findings. Whilst the quantification of talk and text and the use of statistical test are commonplace in "coding and counting" methods, for instance those involving content analysis (Hsieh/Shannon 2005), and metaphor analysis (e.g. Moser 2000), the quantification of talk-in-interaction is particularly controversial in CA (Schegloff 1993). Conversation analysis is fundamentally grounded in the analysis of naturally occurring data (Heritage 1995), and is built on specific assumptions about conversation as a fundamental social institution through which the majority of human business is conducted (Heritage 1984). It seeks to explicate the forms of action that talk performs within specific contexts, and to describe and explain the function of interactional practices (Heritage 1995; Schegloff 1984). It places great emphasis on the sequential nature of interaction and the local context of utterances, and uses the reaction of interactants to interpret the meaning of preceding talk. As such, Schegloff issues caution about relying on statistical comparisons of coded content, without demonstrating evidence of how a particular phenomenon is taking place in its local context. Nevertheless CA studies have demonstrated use of statistical analysis (e.g. Robinson/Heritage 2006, Stivers 2002, Heritage et al. 2007), and as demonstrated by the first of the four studies discussed here, statistical transformation of qualitative findings generated by CA can have important clinical implications.

2. Diagnostic challenges in seizure clinics

Epileptic seizures and "psychogenic" or nonepileptic seizures (NES) are key reasons why people present to healthcare practitioners with transient loss of consciousness (Angus-Leppan 2008; Kotsopoulos et al. 2003). Epileptic seizures are caused by abnormal electrical activity of the brain, and are treated with antiepileptic drugs or surgery. NES resemble epileptic seizures superficially, but are caused by an abnormal (dissociative) response to distressing external or internal triggers, and best treated with psychological treatment (Malmgren et al. 2012). Whilst the correct differentiation between epilepsy and NES is therefore of great clinical importance, the diagnostic process is challenging, and several studies have demonstrated that epilepsy tends to be overdiagnosed whereas the diagnosis of NES is often missed for several years. This means that over three quarters of patients with NES are initially (and inappropriately) started on treatment for epilepsy with potentially severe negative consequences (Reuber et al. 2002; Reuber et al. 2004).

In clinical practice the diagnosis is primarily based on the doctor's interpretation of the patient's history and witness accounts. "Gold standard" diagnoses are supported by the recording of a typical attack with simultaneous video-electroencephalographic (vEEG) and electrocardiographic (ECG) recordings capable of revealing a physiological cause in some cases. Regrettably, most patients' seizures are too infrequent to make the recording of episodes a viable option (Jacoby et al. 1996). Tests which can be performed in the interval between seizures (such as "interictal EEG" or brain imaging) can only make a limited contribution to the diagnosis. Therefore the account of the seizure manifestations provided by the patient with seizures (and any witnesses of attacks) remains the cornerstone of the diagnosis (Wolf et al. 2005).

Most previous research investigating the patient's history has focused on factual information. For instance, persistent eye closure during a convulsive seizure, ictal weeping or vocalization, and seizure duration in excess of three minutes all suggest NES (Reuber/Elger 2003). Unfortunately, in real life, many of these features rely on the presence of seizure witnesses rather video-documented observation, and patient and witness reports have been found to be so inaccurate that the sensitivity and specificity of the signs become inadequate for clinical use (Syed et al. 2011). Although experienced clinicians will often come away with a relatively clear idea of the patient's diagnosis, and are happy to recommend appropriate treatment (Angus-Leppan 2008), these studies demonstrate that clinical decision-making in this setting is a complex activity in which doctors need to analyze how commonly particular features or test results occur in the different conditions under consideration, and take account of the differential diagnostic reliability of the observations made.

3. Previous linguistic studies of seizure patients' talk

Prompted by the fact that the communication between clinician and patient remains the basis of these difficult but important diagnostic and treatment decisions, studies involving methods designed to study conversation scientifically have been applied to discussions about seizures between patients and clinicians. The initial

research at the University of Bielefeld and the Bethel Epilepsy Centre in Germany (Gülich 2005; Gülich et al. 2002; Gülich/Schöndienst 1999; Gülich/Schöndienst/Surmann 2002; Schöndienst 2002; Schöndienst et al. 2004a; Schöndienst et al. 2004b; Schöndienst et al. 2001; Schwabe 2004; Surmann 2005) involved an unusually open history-taking style intended to allow patients to set the agenda, with the doctor's apparent control of the interaction remaining limited.

The analytic approach to these encounters was inspired by and grounded in the analytic methodology of Conversation Analysis (CA) (Hutchby/Wooffitt 1998; Sacks et al. 1992; ten Have 2000, Sidnell/Stivers 2012), and focused especially on *how* patients talk about their seizures, rather than *what* they say. The Bielefeld group described two contrasting conversational profiles and found that these profiles tended to match patients' medical diagnoses: whereas patients with epilepsy were likely to volunteer detailed talk about subjective seizure symptoms, patients with NES tended to avoid symptom descriptions and to focus on the circumstances or consequences of their seizures (Schwabe et al. 2008). This was most readily apparent when patients were prompted to speak about particularly memorable seizure episodes. Descriptions of seizures by patients with NES lacked information about subjective seizure symptoms and the seizure narratives were often incomplete (Kallmeyer 2002; Reuber et al. 2009; Surmann 2005).

4. Current research: the data

In this article we describe a set of four studies conducted at the University of Sheffield which build on the work at Bielefeld, Germany. The studies described here did not only benefit from the content of the seminal work in this field carried out by Elisabeth Gülich (a linguist working with conversation analytic methods) and Martin Schöndienst (a neurologist and psychotherapist) but also from the model of scientific collaboration between members of different disciplines which the Bielefeld group had established (Schwabe et al. 2008). The four studies discussed here all explored one dataset – video recordings and verbatim transcripts of patients interviewed by a neurologist at the Royal Hallamshire Hospital in Sheffield in 2005/2006. All patients had undergone vEEG because the referring neurologist was uncertain about the nature of their seizure disorder. Twenty patients were included in the first study (13 with epilepsy and 7 with non-epileptic seizures), and one extra patient (with non-epileptic seizures) in the second, third and fourth studies. All patients had seizures involving loss of consciousness, and "gold standard" diagnoses (the observation of a typical attack by vEEG) were made in all cases. The interviews capture initial meetings between the neurologist and the patient and were undertaken during the patient's admission for vEEG observation before the interviewing doctor or the patient knew about the ultimate outcome of the vEEG test.

The interviews, unlike typical outpatient consultations, had a very open beginning (making no mention of seizures) allowing patients to determine the initial focus of the conversation. Even when patients were prompted to talk about specific seizures, the use of open questions left them free to choose what they considered most relevant (for a more detailed discussion see Reuber et al. 2009). In the four sections that follow, we will examine four distinct analyses of this data. The transcripts were analyzed by linguists who were blinded to all additional information

(including the result of the vEEG monitoring). We will focus on how, motivated by the multidisciplinary nature of the research team and the specific clinical aims of the project, these studies used quantitative approaches to translate qualitative findings generated by conversation analysis, metaphor and content analysis into diagnostically useful results.

4.1. Using Conversation Analytic observations to predict the patient's diagnosis

The aim of this study was to find out whether the interactional, linguistic and topical differences first described by the Bielefeld group using Conversation Analysis could be employed prospectively to predict a diagnosis of epilepsy or NES (Reuber et al. 2009). A range of previous publications describe the application of a Conversation Analytic derived methodology to this clinical setting (Schwabe et al. 2008; Gülich et al. 2002; Schöndienst 2002). The transcribed interviews and original video recordings were analyzed independently by two linguists blinded to all other information about the patients (including their vEEG diagnosis). The linguists were asked to examine the interview recordings and transcripts and search for 17 features identified in the Bielefeld studies that might help them predict the patients' diagnosis (see appendix for details). We will present an example of the conversation analytic findings before describing a Diagnostic Scoring Aid (DSA) which was developed as a tool to turn the qualitative data generated by the Conversation Analytical interpretation into quantifiable observations (that is, assign numerical values to data that consists of words; Sandelowski/Voils/Knafl 2009).

We start by providing some examples of the conversation analytic findings. The previous research showed that patients with epilepsy typically focus easily on the seizure episodes and provide coherent, structured accounts of seizure episodes. Patients with NES, in contrast, seem to offer negative, undifferentiated or "holistic" statements such as *I never remember anything about my seizures*, and provide more information about the circumstances in which the seizures took place or their consequences (Schwabe/Howell/Reuber 2007). The analysts in the Sheffield project examined sequences in which patients were questioned about specific seizure episodes, and were able to identify these differences. As becomes apparent in the extract below, when responding to the interviewer's question about the patient's first seizure, Barbara (who was later revealed to have had a diagnosis of NES), provides no information about her symptoms, instead describing who was present at the time of the seizure in question:

(1) 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.

The doctor's turn seeks a telling from the patient, specifically relating to their first seizure. The analysts in the study identified how this patient does not describe the details of what took place during this seizure, or what she felt when she lost or regained consciousness. Thus in terms of item two of the DSA (see appendix), Barbara does not volunteer the description of subjective seizure symptoms. Instead she begins by talking about who she saw when she came round, and quickly focuses on her present absence of memory (Plug/Sharrack/Reuber 2009a). She also shifts away from the individual seizure and describes a more generic (and minimal) experience of loss of consciousness which would be coded as a holistic statement in item 14 of the DSA: *bang, that's it I'm gone*. This linguistic feature of resisting focusing on individual episodes (which corresponds with item six in the DSA), is more typical of patients with NES, and is even more stark in Barbara's response to a question about her 'worst seizure':

(2) 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.

The doctor's turn is designed to elicit a telling of a different episode: specifically the worst seizure the patient has experienced. Instead of providing a description of a single seizure, in her response Barbara lists multiple seizure episodes, and focuses particularly on the consequences of these episodes (such as almost drowning, or requiring the fire brigade) rather than providing subjective seizure symptoms.

The interview with a different patient, Jack (diagnosed with epilepsy), on the other hand, had features that were more common amongst patients with epilepsy. He volunteered an account of a single seizure episode before the interviewer invited him to provide one which would be coded as the patient introducing the focus on seizure descriptions in item one of the DSA. When Jack was asked about his last seizure, despite displaying difficulties to remember he remains on topic and makes an effort to provide details:

(3) 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.

The neurologist initiates talk about the patient's latest seizure episode, inviting the patient to provide a telling with reference to it potentially being "easier to remember" than his first episode which the patient stated occurred in 1973. Jack abandons several attempts at his description, including *I don't really remem-*, but leaves this negative statement incomplete in favor of an attempt to reconstruct what he does remember of the episode (Plug/Sharrack/Reuber 2009a). Thus his description could be coded in item ten in Table 1 as a considerable attempt to contour the loss of consciousness based on his own recollections. He begins to describe the events including providing subjective symptom descriptions (light headedness), about which he provides further details when asked in the talk that follows, details which are relevant to item seven in the DSA (Plug/Sharrack/Reuber 2009a).

The analysis of transcripts in this study was guided by the Diagnostic Scoring Aid (DSA). This tool initially guided the linguists to develop a diagnostic hypothesis (epilepsy or NES) for each patient based on their brief written qualitative assessments addressing the previously described 17 features with differentiating potential (see appendix for details). The emphasis CA places on sequential analysis was embraced by this approach: although data used to judge the 17 features was not distributed evenly across all phases of the encounters, the linguists were encouraged to base their interpretations of each feature on their analysis of the whole transcript. In a second step, the DSA encouraged the linguists to translate each of the 17 separate reports about different observations into a number (scoring 1 – if more in keeping with epilepsy; 0 – if the linguist was uncertain or was unable to rate; and -1 if more in keeping with NES). The DSA was based on an operationalization of the previously described features with potentially discriminating value. The 17 points on the DSA were identical to the analytic headings the linguists were encouraged to address in their written reports.

The method in this study departed from a traditional Conversation analytic approach in several ways. For example, rather than undertaking an unmotivated examination of the way social activities are organized in the data (Liddicoat 2011), and producing systematic descriptions of the common patterns and procedures people use to communicate, linguists were instructed to consider 17 pre-specified elements of the talk. In doing so they were, however, encouraged to consider the whole transcript when addressing each point and when coming to their final conclusion, retaining the conversation analytic approach to examining talk sequentially. Another key contrast to traditional Conversation Analysis (CA) was that the linguists were asked to assign a numerical score to their analytic findings using the DSA.

Both the qualitative diagnoses and the quantitative approach using the DSA showed promising agreement with the medical diagnoses confirmed by the vEEG

test. Using the structured qualitative approach, both linguistic raters correctly predicted 85% of diagnoses (Reuber et al. 2009). A nonparametric receiver operating characteristic (ROC) curve was based on the total DSA scores to determine diagnostic cut-offs with optimal sensitivity and specificity of the semiquantitative diagnostic procedure. K values were calculated to determine the interrater reliability of the qualitative diagnostic procedure and of individual DSA items. K values were considered to represent poor (<0.2) to very good (0.81-1.00) levels of interrater reliability. The quantitative DSA scores produced by one of the raters categorized 80% of patients correctly, those of the other, 75%. All linguistic ratings contrasted positively with the referring neurologists' working diagnoses prior to admission, which only proved accurate in 40% of cases after the vEEG recording of typical seizures. Kappa statistics were used to express the inter-rater reliability of the diagnostic approach in numeric terms. The Kappa value of 0.59 based on the use of the numeric DSA procedure means that interrater reliability was "moderate" and comparable to that of vEEG analysis used in isolation (Reuber et al. 2009; Benbadis et al. 2009).

In addition to departing from traditional CA studies by being hypothesis-driven, using guided (and thereby constrained) qualitative analysis, and by incorporating numeric scores, the study design also incorporated ideas more familiar in biomedical research such as the blinding of the rater for information other than the data contained in the video-recording and transcript of the encounter (which is not at odds with traditional CA) and the use of Kappa statistics to describe interrater reliability (which requires raters to make categorical or quantifiable judgments).

4.2. Metaphoric conceptualizations

The second study examined the metaphoric conceptualizations of seizures used by patients in their interactions with the doctor (Plug/Sharrack/Reuber 2009b). The linguist searched the transcripts for all direct references to seizures and identified those which fulfilled the definition of a metaphor proposed by Lakoff and Johnson (Lakoff/Johnson1980): a metaphor is an expression that is used in one semantic field while its core meaning, as defined in dictionaries of contemporary English, lies in another. Metaphors were of particular interest for this project because, as Lakoff/Johnson state, "metaphor is not just a matter of language, that is, of mere words [...] on the contrary, human thought processes are largely metaphorical" (1980:6). According to Lakoff/Johnson metaphors are conceptual and grounded in our bodily experience. The fact that epilepsy and NES are different bodily processes suggests that this difference might be reflected in the different metaphorical choices speakers make when they talk about their seizures.

For example, the expressions 'when I *came out of* the seizure' and 'I thought the seizure was *trying to force itself out of me*' are clearly grounded in previous bodily experiences. They are metaphorical since the core meaning of *coming out of something* entails the existence of a place or space as well as physical movement, and the core meaning of *trying to do something* entails a volitional agent. In all of these cases, patients used their general vocabulary to formulate specific subjective experiences for which they know little or no specialised terminology (Plug/Sharrack/Reuber 2011).

In keeping with the method of Lakoff and Johnson, and using contemporary dictionaries (Longman dictionary of contemporary English 1987; Cambridge advanced learner's dictionary 2003), qualitative judgements were made grouping individual metaphors together according to the general semantic field with which they were associated. Metaphors such as 'the seizure *took place*', 'I just let it *run its course*' and 'then the seizure *started*' were grouped together as instances of the conceptual mapping THE SEIZURE IS AN EVENT, while 'when I *came out of* the seizure' and 'I thought the seizure was *trying to force itself out of me*' were considered incompatible with this particular mapping: in the first case the seizure is treated as some kind of location, while in the second it appears to be personified. In fact, the linguist established three common conceptual mappings: THE SEIZURE IS AN AGENT/FORCE, THE SEIZURE IS AN EVENT/SITUATION and THE SEIZURE IS A PLACE/SPACE. Extracts illustrating these metaphors can be found in box 1 below (for more detail see Plug/Sharrack/Reuber 2009b).

Box 1: Interview fragments illustrating metaphors
(taken from Plug/Sharrack/Reuber 2009b)

Example 1: David (Epilepsy diagnosis)

I had to contain it, so that I was (...) within me- meself, and that's what (0.2) huh I thought it were trying to do; (1.0) and then it came and er and then it did it again; (0.8) and I did it again, (1.2) and then I think next thing is (1.0) thing I can remember is er (3.4) I can't (0.7) I can't remember whether me mum had got (0.3) got hold of me (1.2) in the car (0.2) taking me upstairs where I were just laid on the bed upstairs

Analysis

In the course of describing a particular seizure episode in some detail, David uses several metaphors that have the seizure as subject or object: he characterizes the seizure as something to be contained, and as something that came and tried to do things. All four metaphors suggest that David has conceptualized the seizure as an agent or force.

Example 2: Sue (NES diagnosis)

he was talking to me (0.2) cause he always speaks to me while I'm having a seizure or (1.1) whatever; he talks to me all the way through it, cause (0.8) s- he's hoping that it brings me out of it quicker (0.4) cause I have had (0.3) erm repeated fits

Doc: mmm

Sue: so erm, he don't li- he don't like that

Doc: mmm

Sue: so he tries to talk to me, to stop me going back into another one

Analysis

In the course of describing her husband's reaction to her seizures, Sue uses three metaphors that suggest a conceptualization of the seizure as a space.

Between group comparisons were based on counts of the number of metaphor "types" and "tokens" used by each patient in each conceptual mapping or category of metaphor. A metaphor "token" was defined as each use of a metaphoric expression fulfilling the definition of metaphor given above. A metaphor type was defined as one particular kind of metaphorical expression. Statistical analyses of differences in type and token counts between the two patient groups (epilepsy/ NES) were conducted. A logistic regression analysis was carried out to assess the differential diagnostic value of metaphoric conceptualizations.

Of 382 metaphors identified, 80.8% belonged to one of these categories. Most patients used metaphors from all categories, but the preferences of metaphor choice differed significantly between the epilepsy and NES groups (Fig. 1). Patients with epilepsy more commonly used metaphors depicting the seizure as an agent/force or event/situation (i.e. conceptualizations in which the seizure had linguistic agency). By contrast, patients with NES more often used metaphors of space/place (i.e. conceptualizations in which the patient had linguistic agency). Logistic regression analyses correctly classified 85.7% of patients with epilepsy or NES based on different metaphor types in each category, or 81.0% of all patients based on all metaphor tokens (Plug/Sharrack/Reuber 2011).

Figure 1 a: Mean number types / patient

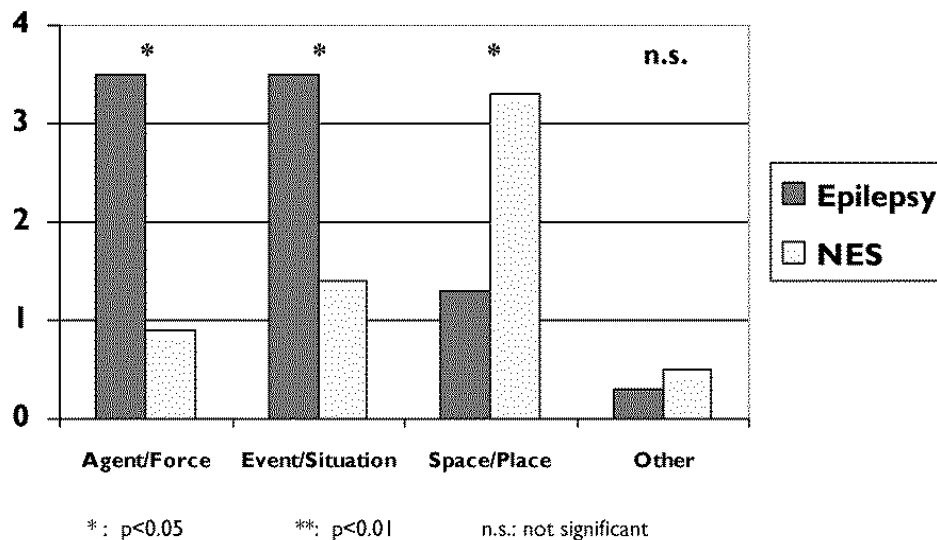


Figure 1: Bar chart showing difference in mean metaphor use between patients with Epilepsy and NES

4.3. Seizure labels

The third study sought to examine the particular difficulties some patients appear to have with naming their problem, and analyzed patients' use of diagnostic labels (Plug/Sharrack/Reuber 2010). All nouns referring to the patients' seizures – such as *seizure*, *fit*, *attack*, *blackout* – were identified and subjected to further qualitative and quantitative analysis. In particular, this study examined whether different

labels were used synonymously or whether differences in meaning could be observed. It also explored whether patients exhibited any difficulties with using the different labels and the extent to which the doctor's use of a particular label affected the patient's lexical choice in the immediately subsequent speaking turns, in addition to a statistical analysis.

The label most commonly used in the 21 transcripts was *seizure* (132 uses), followed by *attack* (66), *fit* (42) and *blackout* (22). Qualitative analysis revealed that patients made fine lexical distinctions between the various diagnostic labels they use to describe their experiences. *Fit* and *blackout* were used more specifically than *seizure* or *attack*: *Fit* described events involving stiffness and shaking, *blackout* those with loss of muscle tone and collapses. What is more, whereas *fit* and *blackout* were represented as lay terminology, the term *seizure* was typically only used for attacks which had been diagnosed as such by a health professional. Patients with NES used fewer symptom labels than patients with epilepsy (Fig. 2).

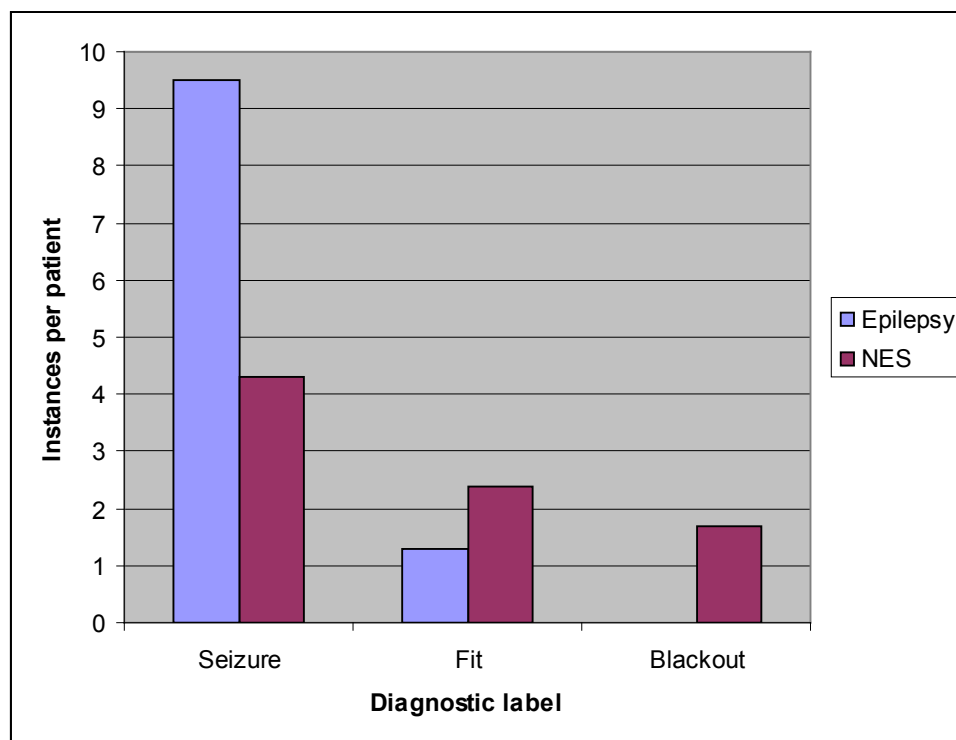


Figure 2: Bar chart showing mean instances per patient for seizure, fit and blackout in epilepsy and NES subgroups

Although the term *seizure* seemed to be the most commonly employed label (and was used by 8/13 patients with NES), qualitative analysis identified many patients who displayed a degree of resistance towards this "medical" term. Apart from the failure to use the term *seizure* altogether (and showing a marked preference for the use of pronouns instead of any term), this resistance could become evident by patients only talking of *seizures* after prompting by the doctor, by hesitations (Pat: *I seem to have, erm, two different sorts of (0.9) seizures happening*, Plug/Shar-rack/Reuber 2010:107), the use of comments expressing a lack of commitment to

the term (Betty: *during the seizure or whatever it is I've had*, Plug/Sharrack/Reuber 2010:105), or by self-repairs:

(4) Tallulah [4:20-4:30]

D: Is this related to (.) to the seizures er er not waking up from a seizure or just not (.) waking up?

T: Not waking up from (0.3) a sei- er (sp?) having a fit.

The display of resistance towards the term *seizure* appeared to have differential diagnostic value: 10/13 patients with NES but only 1/8 with epilepsy showed such resistance ($\chi^2=8.24$, $p=0.004$) (Plug/Sharrack/Reuber 2010).

This study again used a combination of qualitative and quantitative approaches. Coding and counting interactional observations relating to the labels patients used to describe their seizures yielded numbers which could be subjected to statistical comparisons between two patient groups, whilst the qualitative analysis provided more in depth understanding with observations relating to the immediate interactional context, offering insight into the mechanisms of the use of labels and their meaning.

4.4. Analysis of references to third parties not present during the encounter

The final study analyzing the same dataset focused on patients' mentions of other people (third parties not present during their interaction with the doctor) when they describe periods of loss of consciousness. In this study, a linguist blinded to the final medical "gold standard" diagnosis examined the conversations between the patients and the neurologist using content analysis (Robson et al. 2012). Content analysis regularly involves quantification; words or themes in the recorded interview transcripts are analyzed in terms of the presence, meaning and relationships between concepts in order to extract quantifiable measurements. However, content analysis begins with a qualitative phase in which a coding framework is developed and transcripts or text are coded.

In the context of this study, the linguist initially identified all references to third parties. Patients referred to third parties not present during their conversation with the doctor when, in describing their seizure experiences, they mentioned a family member, partner, friend, colleague, medic, passerby or anyone – named or otherwise – who may have witnessed the event, or who may have witnessed the patient's state, or to whom the patient spoke in the aftermath of the seizure event (e.g. *I came round and saw the ambulance man over me*). Third party references were coded for their relationship to seizures, the referent and whether they were spontaneously made by the participant or prompted by the interviewer (prompting ordinarily occurred in the phase during the end of the consultation, when the neurologist challenged certain aspects of the patient's account). An interim review of the data at this point revealed that many third party references seemed to serve the purpose of normalizing or catastrophising the patient's experience. The identified third party references were therefore coded further as 'normalizing', 'catastrophising' or neither of the two. References were coded as 'normalizing' when patients

seemed not to treat the problem as serious in their account ('troubles resistance'), or when they played down, minimized or negated perceived or encountered seizure dangers or the emotional and social impact of having seizures. The concept of 'troubles resistance' has been well defined and documented in the literature about communication in medical care; it involves patients describing problems and then demonstrating how they have overcome them (Heritage 2009; Jefferson 1984). 'Normalizing' activities have previously been described in a study exploring interactional and linguistic displays of coping with epilepsy (Reuber et al. 2009).

The development and application of coding units were peer-reviewed by three specialists in medical communication to ensure reliability and validity. A total of 510 third party references were identified and coded. Third-party references were used as commonly by patients with epilepsy (mean 23.1/encounter) as by patients with NES (mean 26.8/encounter, difference; n.s.). However, "catastrophising" third party references were made in 12/13 (92.3%) of encounters with NES patients but only 1/7 (14.3%) of encounters with epilepsy patients ($p=0.001$). In contrast, "normalizing" references were identified in 2/13 (15.4%) of encounters in the NES and 6/7 (85.7%) of encounters in the epilepsy groups ($p=0.004$). Catastrophising references were 72 times more likely to be used in encounters with NES patients (95% CI: 3.8–1361), normalizing references were 33 times more likely to be used in encounters with patients with epilepsy (95% CI: 2.5–444). For examples of "catastrophising" or "normalizing" references see box 2.

Box 2: Illustrative examples of "catastrophising" or "normalizing"
(taken from Robson et al. 2012)

Example 1: Henry (Epilepsy diagnosis – use of normalising)

Doc: What do your friends tell you about the seizures.

Pt: Well nowt really. They just (0.3) they just tell me
I've just had another seizure (1.5)
or I've had one of my funny turns like as
they sometimes call it.

Doc: Mm
(0.7)

Pt: Er (0.7) other than that I'm alright, there's no problems
(2.5) me me me friends are
well aware of it and that like so (0.3) We all live together
in a group so (1.1)

Analysis

In this extract the patient refers to the third party (friends) as simply reporting the seizures they witness, using the minimizing term 'just'. He then further normalises the seizures by describing a lack of problems, evidenced by the fact that they Henry and his friends live together.

Example 2: Sue (NES diagnosis – use of catastrophizing)

Pt: Without me husband ((laughs)) I never go anywhere else without him.
Doc: mh,
Pt: Never (0.4) cause I'm too afraid.
Doc: mhmh
Pt: I'm frightened because I've had fits in the street I've had them in the middle of the road, I've had them in the bath and nearly drowned. I had to be revived, you know give the kiss of life, when er the bath. I've had them all over. I've pulled pans an top of me, I've, I've even had an iron on top of me. (1.9) But this is when I were having a lot, I were having at ten at a time, in a day.
Doc: hm;
Pt: One time (0.8) but I haven't had any of them lately because he's always there ((laughs)) for me.
Doc: mh,
Pt: He won't let me do the things that he finds dangerous.
Doc: mh,
(-)
Pt: Like he won't, he won't let me use pans or, or boil a kettle, or or anything that he thinks I might endanger myself with.

Analysis

In this extract Sue refers to not going anywhere without her husband, and describes her husband as preventing her from doing certain things so that she doesn't endanger herself. Sue lists a set of scenarios in which she has had seizures with potentially fatal consequences (drowning, burning, road accidents). The frequency and severity of the episodes are emphasised with reference to the third party's treatment of the patient as at risk.

This study began with a qualitative search of the data in order to identify references to third parties, and analysis which identified the normalising or catastrophising function of certain references. This led to the development of a coding frame which generated quantitative frequencies which could be statistically examined and led to the identification of significant differences between the patient groups.

4.5. Clinical significance of conversational findings

Evidently, the interactional and linguistic observations generated in the studies described above can contribute diagnostic pointers in a complex data field rife with uncertainties. In addition, it has been argued that these observations also contain clues about the way in which patients with NES experience their seizures, and point to etiological aspects of NES, such as the psychopathology associated with this seizure disorder or to how patients cope with epileptic seizures (Robson et al. 2012; Plug/Reuber 2009; Reuber et al. 2009; Reuber/Micoulaud-Franchib/Gülich/Bartolomei/McGonigal 2014). These insights can inform the way in which doctors seek to elicit talk from the patient, and enable them to identify additional

medically relevant information pertinent to forming diagnostic judgments and making treatment recommendations.

All of the studies described above combine qualitative and quantitative methods in different and in some cases novel ways. Whilst the project originated with and began using a conversation analytic approach, quantification and statistical tests were introduced on the basis that doctors need this sort of information when they consider the diagnostic value of a particular observation (or indeed a methodological approach). In the diagnostic setting, clinicians need to know the probability of making a particular observation in patients with a certain diagnosis and the reliability of this observation. Having said that, the quantification of qualitative findings can only be useful if the process of quantification does not invalidate the qualitative methodology used, and if the validity and reliability of both methods stand up against robust interrogation.

5. Combining qualitative and quantitative analysis to talk-in-interaction: problems and prospects

Conversation analysis (CA) has traditionally avoided quantification, instead being grounded in establishing claims about patterns of actions as displayed in the orientation of participants, rather than judging the weight of an observation using quantifiable measures or methods or statistical approaches (Schegloff 1993; Liddicoat 2011). Quantification is not proposed as an alternative to single case analysis within CA (Schegloff 1993). Although CA studies often involve establishing collections of similar actions to test the robustness of a particular description of an action, the analysis is founded upon how a recipient on each single occasion, shows himself or herself to have understood it, most commonly by so treating it in the ensuing interaction, and no number of other episodes that developed differently will undo the fact that, in this case, it went the way it did (Schegloff 1993; Liddicoat 2011).

Having said that, conversation analysts do not oppose the use of quantification, merely what is considered to be its premature use (Hopper 1989). Whilst there has been little explicit debate about quantification and CA since Schegloff's (1993) paper, combining CA with quantitative approaches in the analysis of naturally occurring talk has taken place in several medical settings. For example Robinson and Heritage (2006) combined a qualitative description of the type of opening question (open vs. closed) doctors used and a quantitative measure of patient satisfaction, and Stivers (2002) undertook a qualitative examination of the nature of a parent's problem presentation (symptom only vs. candidate diagnosis) and a count of mentions of antibiotic treatment. A qualitative CA approach has also been used as the basis for a prospective experimental study (see Heritage et al. 2007). Last but not least, CA has been combined with quantitative methods to develop assessment tools and facilitate therapies (for example in patients with aphasia; Friedland and Miller 1998; Whitworth 2003). In this way researchers have been able to compare the conversation analytic and quantitative analytic findings in order to assess the effectiveness of an assessment tool. For example, Perkins/Crisp/Walshaw's (1999) comparative qualitative and quantitative analysis of talk between patients with aphasia and their conversational partners supported the reliability and validity of both approaches as evaluative measures of therapy.

One of the key problems encountered in CA studies involving quantification is the categorization of highly complex and variable interactional phenomena into a modest number of features of interest. This reduction of nuanced and rich data to a single instance is based on the subjective judgement of the rater. The reliability of a particular rating scheme can be assured by coding rules and checks of their interrater reliability. However, the findings are likely to be highly dependent on the coding framework chosen. The same episode of talk can be categorized in many different ways.

Other language-based analytic approaches may face very similar problems. The metaphor study presented here (study two) is a good example. In the initial analysis of the metaphor data three major metaphoric conceptualisations emerged, and metaphoric expressions were, whenever possible, added to one of these categories. These three metaphoric conceptualisations proved clinically meaningful because patients' metaphoric preferences predicted their diagnosis with impressive accuracy. However, in a subsequent study not discussed here in detail, the same dataset of metaphors was subjected to a more detailed cognitive analysis and many more subcategories emerged (Plug/Sharrack/Reuber 2011).

5.1. Combining analyses: the benefits of triangulation

Checking qualitative and quantitative results against each other is the central idea of triangulation: increasing the validity of an analysis by employing various methodologies in the study of the same phenomenon (Denzin 2012; Flick et al. 2012). Like Perkins/Crisp/Walshaw's (1999) study, the first study we have described was able to offer insight into the validity of an assessment tool, and in this way offer triangulation in the form of assessing the veracity of research results (Mertens/Hesse-Biber 2012). The talk (in this case between a neurologist and patient) was analysed using CA and the DSA used to condense the qualitative findings into a numeric summary score (Reuber et al. 2009). This study has the unusual additional quality of having an externally validated "gold standard" medical diagnosis against which the accuracy of other measures which differentiate between conditions can be assessed. Reuber et al. (2009) found that the accuracy of the diagnosis based on qualitative analysis was slightly better (85%) than that based on the numeric DSA ratings (depending on the rater, 80% or 75%), although both approaches were much more accurate than the working diagnoses patients had received from their neurologists prior to admission (40% accurate). The finding that the accuracy of the numeric diagnostic score was slightly poorer than that based on purely qualitative assessment is suggestive of some limitations to the quantitative DSA approach: It may relate to the way in which all items are given equal diagnostic value in the DSA in contrast to the freedom the qualitative procedure affords the analyst in putting emphasis on particular observations. It may be possible to improve the diagnostic performance of the DSA by giving diagnostically more reliable items more weight (Reuber et al. 2009).

The drive to improve quantitative measures despite initial findings that the qualitative approaches potentially offer more accurate and insightful findings relates strongly to the clinical and applied settings in which these tools are being developed. Recording and undertaking a full analysis of each consultation is not a realistic endeavor for most clinicians. Instruments designed simply to identify

features relevant to diagnosis and intervention are valuable to clinicians who are faced with making evidence-based categorical decisions within a limited time frame. By breaking down the process of linguistic analysis into clearly identifiable separate components, the Diagnostic Scoring Aid paves the way for simpler diagnostic tools (focusing on a smaller set of more easily observable features) which could be used by doctors as they talk to their patients and "listen out" for interactional and linguistic clues to the diagnosis. Indeed, such a simple tool is being evaluated in an ongoing study (Jenkins/Reuber 2014).

As the concept of triangulation has developed, it has come to not only refer to confirming results derived from another method, but as a means by which to extend the knowledge potential (Flick et al. 2012), securing in-depth understanding of the phenomenon (Denzin 2012) by generating different perspectives and nuanced meanings which contribute to a more informative picture of what is going on (Torrance 2012; Mertens/Hesse-Biber 2012). This is exemplified in the study of seizure labels (described in section 2.3) which used a qualitative analysis to provide more in depth understanding of the statistical findings by exploring observations, observations which offered insight into the mechanisms of the use of labels. In this way the combining analysis of talk-in-interaction contributes to the dialectical process of gaining further insight into the findings (Mertens/Hesse-Biber 2012). Thus in terms of validating findings or providing greater depth of understanding, combining analytic approaches in these studies lead to a triangulation of results with rich benefits.

5.2. Quantification: Compromising the sequential environment?

When considering combining qualitative and quantitative approaches to talk-in-interaction, one of the most troublesome issues is the extent to which conversational behavior is examined within the sequential context in which it is delivered, or whether it is compromised as aspects are removed from their context for counting (Perkins/Crisp/Walshaw 1999). CA is founded on a particularly strong assumption that talk is produced by participants in ways oriented to the specific situations in and for which it is produced (Psathas 1995). A speaker's actions contribute to the on-going interaction and can only be understood with reference to the context, particularly what comes before it (Psathas 1995). The collaborative nature of interaction is particularly vulnerable to being lost if the actions of two interlocutors are separated from each other (Perkins/Crisp/Walshaw 1999).

Within the second, third and fourth seizure clinic studies we described, the method did include identifying, isolating and coding individual aspects of talk. The study on metaphorical conceptualizations (2.2) involved coding metaphors used by patients to refer to seizures, and the results are presented in terms of frequency of metaphors used in different patient groups. It builds on a large body of literature that has produced corpus-based and discourse-oriented analyses of metaphor use, which argue for a close consideration of recorded discourse (e.g. Deignan 2005; Cameron/Deignan 2006; Allen 2009). However, one key question raised by conversation analysts is whether these counts offer a meaningful measure of the use of metaphors. According to CA, such a study requires that the analyst understands in which environments metaphors are possibly relevant, and the case analysis should consider what someone is doing by using a metaphor in that

particular local context, how the sequence is organized, and how it relates to what has come before (Schegloff 1993). This, Schegloff (1993) argues, is a precondition for effectively exploring the phenomena using quantitative analysis.

This classification of linguistic meaning or content rather than action represents a significant departure from the approach described by Schegloff (1993) as grounding the claim in the displayed orientation of a co-participant. However, although metaphoric usage is subtle, and the patient's turn is inevitably shaped by what came before, the interviews were designed specifically to include questions which were as open and neutral as possible, with the interviewer following the same rigid schedule in each consultation. In this way the interview method sought to avoid reference to seizures and allow the patients to introduce their own labels and metaphors. Further, the logistic regression analysis demonstrated that preferred metaphoric conceptualizations did not just differ between patients with epilepsy and those with NES but could actually be used to differentiate with a high degree of accuracy between patients talking about epileptic or nonepileptic seizures (Plug/Sharrack/Reuber 2009b).

While the study examining metaphoric conceptualizations, and likewise, the study described in 2.4, depart from a CA approach in theory and analytic focus in terms of not prioritizing a consideration of the sequential-orientation of talk (Drew/Heritage 1992; Schegloff 1986), they highlight additional linguistic differences between the two diagnostic groups which are available to be further explored, for instance in questionnaires asking patients to endorse or reject seizure experiences reflecting particular metaphoric conceptualizations.

These sorts of findings also represent potential preliminary analysis for a more traditional CA approach. The article described in 2.3 adopts this technique. It begins by presenting quantitative frequencies of words used to label the seizure, and then develops the analysis by considering examples within the sequential context to explore in more detail the situated use of labels in CA tradition with specific reference to the talk that came before it. While the focus is on the immediate sequential relevance, this study does not consider the larger context in terms of whether terms have been introduced in the interview prior to these particular turns. However, it does retain the collaborative nature of interaction at the micro level that Perkins/Crisp/Walshaw (1999) refer to. In common with Stivers' (2001) paper, in addition to providing a statistical overview of types of labels used in the different patient groups, it is possible to provide an analysis of specific examples grounded in their context when explaining how the labels are delivered with a sensitivity to the temporally organized sequences of talk, and the way they are fitted to the prior utterance. Studies 2.2 and 2.4 are available to be developed in this way.

Overall, we argue that it is critical not to lose sight of the importance of constructing a research design which centers around the specific research question and research context (Hesse-Biber/Johnson 2013). Whilst a pragmatic perspective holds value in terms of selecting techniques to solve practical, in this case clinical, research problems (Teddlie/Tashakkori 2002), we recognize the essential assumptions integral to qualitative approaches, particularly CA, which have heavily influenced these studies. We maintain that the systematic and rigorous approach that grounds itself in the interactional context and participants' understandings is fundamental to the examination of naturally occurring talk, and is essential to the

kind of studies we have described above. CA presents several challenges against which alternative methods can be interrogated to test their integrity and validity. It articulates a clear critique against which these methods must demonstrate a defense.

6. Concluding remarks

In this paper we have described four studies which have examined consultations in a seizure clinic using qualitative and quantitative approaches to identify aspects of the patients' talk which are potentially of diagnostic value in distinguishing between epilepsy and NES. These studies join several other examples of research which have, in different ways, combined quantitative methods with CA and other qualitative approaches to answer clinically relevant questions. We have shown the way in which mixed analysis of talk-in-interaction can lead to the development of measures which improve diagnosis and therapy. This is of particular value to clinicians in situations whereby extensive analysis of individual consultations is simply not feasible, and categorical decisions are required, often without delay. Seizure clinics are an environment in which clinicians are faced with condensing a complex set of data into categorical decisions about the most appropriate further investigations and treatments, a process that relies heavily on the patient's verbal account. The benefit of providing clinicians with tools which help them to recognize linguistic features as diagnostic pointers is really quite remarkable. The studies we have described contribute to an exciting and growing field of pioneering conversation analytic work with potential to aid clinical diagnoses. For example, other studies have used a CA informed approach to differentiate between descriptions of panic attacks and epileptic seizures involving anxiety (Schöndienst/Reuber 2008), and more recently distinguishing between the communication profiles of patients with dementia and functional memory complaints (Jones et al. under review).

Both Schegloff (1993) and Heritage (1999) allude to the potential for researchers examining applied or comparative topics to be particularly drawn to consider quantification of talk-in-interaction, and yet both authors warn of the knotty challenges that litter this path. In this article we have begun to discuss some of the difficulties and benefits that emerge when different methods of analysis are used side by side during analysis. Whilst we recognize the cautions that have been described, both in theory, and exemplified within the findings presented, we have described ways in which some of these conflicts have been managed in practice, and argue that the findings from these studies indicate exciting payoffs in terms of improving communication and diagnosis of seizures.

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8. Appendix: Diagnostic Scoring Aid (DSA)

1a: Interactional features

I: Interviewer; P: Patient; 'holistic': broad statements lacking detail, e.g. "I just go", "I'm out".

Item	Description	Observation	Score
1	General focus on seizure experience (rather than seizure situations or consequences)	Introduced by the P	1
		Introduced by the I, followed by P	0
		Introduced by I, lost by P	-1
2	Description of subjective seizure symptoms	Volunteered	1
		Offered only when prompted	0
		Prompting unanswered	-1
3	Description of seizure suppression attempts	Volunteered	1
		Not described/only on prompting	0
		Prompting unanswered	-1
4	Description of 'gaps' (phases of reduced self-control or recollection)	Volunteered	1
		Offered when prompted	0
		Prompting unanswered/'holistic' statements only	-1
5	Response to challenge of statements about 'gaps'	Elaboration or reformulation of previous description	1
		Repeat or minimal elaboration	0
		No prior description/no elaboration	-1
6	Description of individual seizure episodes (possible 'focussing resistance': interactional resistance to focus on particular seizures)	Volunteered	1
		Not offered / episodes explicitly not distinguishable	0
		Not offered, no explicit denial of ability to distinguish episodes	-1

1b. Topical features

Item	Description	Observation	Score
7	Subjective seizure symptoms	Described in great detail	1
		Little or some detail	0
		(Listed but) not described in detail	-1
8	Relative importance of subjective seizure symptoms	Treated as central to description	1
		More or equal attention to circumstantial details	0
		Not described beyond brief statements	-1
9	Relative importance of 'gaps' <i>(phases of reduced self-control or recollection)</i>	One of several elements of seizures	1
		Prominent element of seizure episodes	0
		Defining element of seizures	-1
10	Contouring of 'gaps' in seizure trajectory <i>(e.g. detailing of last memory before / first after seizure)</i>	Clear attempt to contour 'gaps'	1
		Some attempt to contour 'gaps'	0
		No contouring of gaps / no clear seizure trajectory	-1
11	Reconstruction of 'gaps' <i>(e.g. filling own memory gaps with own recollections / witness accounts)</i>	Clear attempts to fill 'gaps' with own recollections	1
		Some attempts to reconstruct 'gaps' with own recollections	0
		No attempts to reconstruct gaps using own recollections	-1

1c. Linguistic features

Item	Description	Observation	Score
12	'Formulation effort' associated with description of subjective seizure symptoms (<i>'formulation effort' includes restarts, reformulations, neologisms</i>)	With marked formulation effort	1
		With some / little formulation effort	0
		No description beyond brief statements	-1
13	Negations in descriptions of seizure experience (<i>absolute: 'I don't remember anything, contextualised: I remember X but not Y'</i>)	Contextualised negations only	1
		With some absolute negations	0
		With pervasive absolute negations	-1
14	'Formulation effort' associated with description of 'gaps'	With marked formulation effort	1
		With some/little formulation effort	0
		No description beyond 'holistic' statements	-1
15	Metaphoric seizure conceptualisation	Consistent across seizures	1
		With variations across seizures	0
		No coherent conceptualisation	-1
16	External / internal conceptualisation of seizures	Consistent seizure conceptualisation as external	1
		Seizures sometimes conceptualised as external	0
		Seizures not conceptualised as external	-1
17	Conceptualisation of seizures as a fight / struggle	Seizures repeatedly conceptualised as a fight / struggle	1
		Seizures sometimes conceptualised as a fight / struggle	0
		Seizures not conceptualised as a fight / struggle	-1

Laura Jenkins
Room B58 B Floor
Queen's Medical Centre
Nottingham NG7 2UH

Laura.Jenkins@nottingham.ac.uk

Prof. Markus Reuber
Academic Neurology Unit
University of Sheffield
Royal Hallamshire Hospital
Glossop Road
Sheffield S10 2JF

markus.reuber@sth.nhs.uk

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