

Chapter 7

Déjà experiences in epilepsy: contributions from memory research

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Abstract

Déjà experiences (such as *déjà vu*) have proved difficult to assess empirically, due to their subjective and unpredictable nature. In this chapter, we attempt to classify the *déjà* states in epilepsy according to known models of memory function and the emerging research work on *déjà* experiences in other groups. We conduct a review of temporal lobe epilepsy, a condition in which *déjà* experiences are commonly reported as accompanying seizures. We describe how qualitative differences in the subjective experience associated with different *déjà* sensations provide support for dual process theories of memory. We consider both stimulation studies and accounts of spontaneous *déjà* experiences. Consistent with other authors, we agree that *déjà vu* represents faulty activation of a restricted network of brain structures known to be crucial for processing familiarity. Our novel argument is that more widespread activation of hippocampal-cortical networks produces *déjà vécu*, distinguishable from *déjà vu* by the erroneous sensation of recollecting contextual information. We suggest that our neuroscientific account and classification of these memory based phenomenon will be a useful guide to future research in this area, and applicable to *déjà* experiences in healthy populations.

I speak first of certain highly elaborate mental states, sometimes called “intellectual auras.” I submit that the term “intellectual aura” is not a good one. The state is often like that occasionally experienced by healthy people as a feeling of “reminiscence,” that on which Coleridge, Tennyson, Dickens, and many others have written. It is sometimes called “dreamy feelings” or described as “dreams mixing up with present thoughts,” “double consciousness,” “feeling of being somewhere else,” “as if I went back to all that occurred in my childhood.” Sometimes there is a definite elaborate vision. Very often the patient is sure of some thought but cannot describe it in the least. ... The patient may describe the state vaguely as “silly thoughts”. These are all voluminous mental states and yet of different kinds; no doubt they ought to be classified ...

Hughlings-Jackson (1880, pp.199–200)

Introduction

Hughlings-Jackson coined the phrase ‘dreamy states’ to refer to the nebulous mental states that may occur during epileptic seizures. These states include sensations and feelings, but notably for a memory researcher, scenes and experiences from the past, like flashbacks. Hughlings-Jackson does not use the term *déjà vu* to describe these peculiar sensations, even though from literary descriptions of the sensation (Dickens’ quote is reproduced below) it is clear that one aspect of this dreamy state is the feeling of *déjà vu*. This lack of use of the *déjà vu* term is probably due to the fact that the phrase, as applied scientifically, had only just been used for the first time, and whilst Hughlings-Jackson would have almost certainly have read about *phénomène de déjà vu*, the term at that time was still being used interchangeably to describe both false and true recognition memory (e.g. Nicholas, 1996).

Contemporary descriptions of a dreamy state converge on the same notion of a disturbance in the contents of consciousness, experienced with an uneasy, dreamlike quality (see Gloor, 1990). Recent research suggests that *déjà vu*-type phenomena are commonly experienced as a direct result of seizure activity. For example, Johanson et al. (2008) have recently carried out a thorough review of subjective experiences in partial epileptic seizures. They surveyed 262 reports of seizures generated by 56 participants. 36% of all accounts (reported by 22 experiencers) included ‘hallucinatory’ experiences, of which 18% were misperceived memories, such as *déjà vu* (e.g. ‘I felt I had walked along this road before’), a combination of *déjà vu* and prescience (e.g. ‘I had a strange feeling that I knew what the people were going to say’), but some were flashbacks, which the authors interpret as ‘actual’ episodic memories (e.g. ‘I saw pictures from a party I went to a long time ago’). Thus we may estimate that approximately 7% of all seizure-related mental phenomena may include *déjà vu*-like experiences. Johanson et al.’s study is typical of an approach that aims to classify and better understand the conscious changes in partial epileptic seizures. In this way, it is a distinct response to Hughlings-Jackson’s plea: ‘no doubt they ought to be classified’. In this chapter, we aim to classify the *déjà* experiences in epilepsy drawing on contemporary theories of memory. We present a review of recent studies into *déjà vu* and epilepsy and examine the memory mechanisms which could possibly differentiate subtypes of the *déjà* experience.

Déjà vu—the state of the art

Currently, researchers converge on a definition of *déjà vu* provided by Neppe (1983): ‘... any subjectively inappropriate impression of familiarity of a present experience with an undefined past’ (p.3). The fundamental aspect of this definition centres on the notion of an *erroneous* sensation of familiarity. This has important implications for the way we conceive the experience in terms of cognitive processes, because of what is currently known from neuropsychological models of human memory, and in particular the role of familiarity and other experiential states in memory retrieval.

The recent upsurge in interest in *déjà* experiences stems from four distinct programmes of research: first, Brown’s exhaustive review of the phenomenon, published variously as review articles and a research monograph (e.g. Brown, 2003, 2004); second, experimental paradigms aimed at producing *déjà vu* in the laboratory (e.g. Brown and Marsh, 2008; Cleary, 2008; Cleary et al., 2009); third, cases of persistent or chronic *déjà* experiences reported in neurologically damaged cases (e.g. O’Connor et al., 2010a); finally, there has been a long tradition of researching the experiential states associated with retrieval in epileptic subjects whilst directly stimulating the cortex. We devote a short section to each of these approaches now, with the final two categories making the bulk of our main argument. For a full overview of these different approaches see O’Connor and Moulin (2010) or Moulin and Chauvel (2009).



Fig. 7.1 *Déjà vu* is a nebulous and eerie sensation which is often the topic of artistic and literary interpretation. © Matt Illman

Brown's review enabled researchers in the field to triangulate on a definition of *déjà vu* that was based upon a more technical use of a pre-existing terminology. Brown (2004) lists 53 different definitions of the phenomenon (pp.13–15) and 20 different versions of the experience (p.16). These subtypes meet little empirical support for their classification (such as *déjà lu*, already read; and *déjà goûté*, already tasted) and lack an overarching theoretical structure. In terms of psychological mechanisms, it is difficult to see what differences there may be between *déjà dit* (already said) and *déjà raconté* (already told)—although such attempts have been made (e.g. Neppe, 1983). Brown's contribution was to reinvigorate the field with a comprehensive review (including psychodynamic approaches and parapsychological accounts) and stimulate the production of work with a clear cognitive psychological viewpoint.

An outcome of Brown's review was to suggest lines for future work. Recent work following up his ideas suggests that *déjà vu*—in healthy undergraduates—can derive from restricted activation of memory traces resulting from prior exposure. For example, Cleary and Reyes (2009) explored reports of *déjà vu* during a recognition without identification (RWI) paradigm. In one experiment, participants studied names of famous places, and were later required to identify scenes, some of which corresponded to the previously studied names. Cleary and Reyes suggest that this led to 87% of participants (33 of 38) reporting at least once incidence of *déjà vu*. In a similar vein, Brown and Marsh (2009), reported that subliminal processing of unfamiliar symbols (exposure of 35ms) increases the likelihood that subsequent supraliminal presentation of the same symbols are rated as having been seen prior to the experiment. Post-experimental questionnaire reports indicated that 50% of participants (12 of 24) experienced *déjà vu*. Perhaps some caution is needed in evaluating these methods: the level of *déjà vu* seems rather high given that this has been a memory illusion that has proved difficult historically to generate in the laboratory, and many

identical manipulations of familiarity presented earlier in the literature make no reference to *déjà vu*. The high level of *déjà vu* reported could be due to demand characteristics, or the generic definition of *déjà vu* given to participants (O'Connor and Moulin, 2010).

Thirdly, there have been single-case reports of *déjà* experiences in patients with neurological damage. For example, Moulin et al. (2005) presented two cases who, as a result of dementia causing damage to temporal and frontal regions, have false sensations of remembering, which cause them to confabulate previous episodes of encoding information. It is not that these patients find things falsely familiar, but that they feel that they are reliving remembered events and they fabricate 'evidence' that they have encountered such events before, an experience which carers spontaneously report as being like persistent *déjà vu*. Such patients are unwilling to engage in activities such as watching television and reading the newspaper as they feel they have already carried them out. Note that normally, *déjà* experiences do not lead to behavioural changes: one is able to challenge and resist the sensation that one has encountered something before. Thus the behaviour of these patients is at odds with the experience of *déjà vu* in healthy participants and—indeed—people with epilepsy. Nonetheless, these cases have offered an opportunity to explore *déjà* experiences in more detail, in the same manner as case studies of amnesia open up our understanding of memory function in healthy people.

Finally, there are those studies, which draw upon the methods first described by Penfield and colleagues, that lead to *déjà vu*-like sensations following direct cortical stimulation: '... gentle electrical stimulation of temporal lobe cortex also produced sudden 'feelings'—sometimes the feeling of familiarity that clinicians had been in the habit of calling *déjà vu*' (Penfield and Perot, 1963, p.597). Penfield and Perot (1963) report directly stimulating the cortex of 1,132 patients, 520 of whom received stimulation of the temporal lobe. Of these, 7% experienced experiential responses and 10% had spontaneous experiential hallucinations following stimulation, for instance: 'I seemed to hear a song, sort of familiar, like on the radio'. The results of such studies carried out with reference to contemporary memory theory make up a large part of the argument presented here.

Recollection and familiarity

This overview (above) pinpoints familiarity as a key concept in the *déjà vu* experience—Brown underlines its importance in his review, Penfield and colleagues refer to the peculiar experiential states of the temporal lobe as illusions of familiarity, and experimental psychologists can produce analogues of *déjà vu* by altering familiarity processes in healthy participants. Contemporary theories of human recognition memory tend to refer to familiarity processes in reference to two—arguably separate—processes of memory retrieval: recollection and familiarity (for a review, see Mandler, 2009). One way of conceptualizing these different memory processes is as producing different experiential states during retrieval. Recollection produces a sense of 'remembering', a state of autonoetic consciousness, or 'mental time-travel' and requires the retrieval of specific details of the instances of encoding a memory trace. Conversely, familiarity reflects noetic consciousness; a more automatic retrieval devoid of first-person experiences and contextual information, sometimes referred to as 'just knowing' (e.g. Gardiner et al., 1998; Tulving, 1985; Wheeler et al., 1997). These two memory processes dissociate from one another behaviourally, but more importantly for the current review, neuropsychological and neuroimaging research also suggests they are based on at least partially distinct neural substrates (e.g. Aggleton and Brown, 1999; Diana et al., 2007; Yonelinas, 2002; Yonelinas et al., 2005). In neuroimaging paradigms, within the temporal lobes, recollection is associated with increased activity in hippocampal and posterior parahippocampal gyrus regions (e.g. Eldridge et al., 2000; Wheeler and Buckner, 2004), whereas familiarity is associated with perirhinal and anterior parahippocampal regions (e.g. Henson et al., 1999; Henson, 2005).

Based on the huge body of research suggesting such a distinction between recollection and familiarity, it seems plausible to theorize that, just as erroneous sensations of familiarity occur to give rise to *déjà vu*, erroneous sensations of remembering or recollecting may occur. It is this distinction between false sensations of familiarity and recollection that we are suggesting might further classify the *déjà* states, and more broadly speaking the dreamy state in epilepsy.

Déjà vu and déjà vécu

We will not reproduce our whole argument here (see O'Connor et al., 2010a), but essentially we suggest that the *déjà* experience can be separated into familiarity (*déjà vu*) and recollection (*déjà vécu*) errors. (For descriptions of *déjà vu*- and *déjà vécu*-like sensations induced in healthy participants, see O'Connor et al., 2008.) In using the term *déjà vécu*, we deliberately borrowed from Funkhouser's (1995) fractionation of *déjà* experiences, one of which was *déjà vécu* (literally, 'already lived'). Notably, to this experience he uses an oft-cited passage (cf. Hughlings Jackson, above) from Dickens' David Copperfield (our italics for emphasis):

We have all some experience of a feeling, that comes over us occasionally, of what we are saying and doing having been said and done before, in a remote time—of our having been surrounded, dim ages ago, by the same faces, objects, and circumstances—of our knowing perfectly what will be said next, as if we suddenly *remember* it!

Dickens (1850, p.236)

This description contains contextual details, associated feelings and thoughts. As such, it parallels recollection, where in remembering an event we are able to draw up contextual information, and the specifics of a previously experienced event (e.g. Conway, 2005). Our chief evidence for the existence of a recollective process at play in *déjà vécu* comes from our cases of recollective confabulation—the dementia patients described as having 'persistent *déjà vu*' who confabulate contextual details and false statements referring to previous study episodes. These are striking errors, made more frequently for novel than mundane events, and always accompanied by feelings of mental time-travel, and reproducing the present as if it is contextual information from the past. With such extreme *déjà* experiences, it is possible to isolate the memory deficit using experimental tasks (Moulin et al., 2005). A few other cases have been reported with the same classification in their descriptions (e.g. Kalra et al., 2007).

In contrast with *déjà vécu*, *déjà vu* is a less specific experience, devoid of contextual information. Funkhouser (1995) describes this as a more nebulous sensation, and differentiates it from *déjà vécu* thus as being 'primarily or even exclusively a mental happening'. It has no accompanying feeling of prescience—the relevance of which will be explored below. To exemplify this sensation he draws on Hughlings Jackson's account of epilepsy (our italics for emphasis):

[W]hat is occupying the attention is what has occupied it before, and indeed has been *familiar*, but has been for a time forgotten, and now is recovered with a slight sense of satisfaction as if it had been sought for.

Hughlings Jackson (1888, p.202)

This passage describes a state which, unlike *déjà vécu*, is incomplete, with an absence of recollective detail, and mental time-travel. We think this latter form of *déjà* experience resonates with contemporary definitions of *déjà vu*. Thus we conceive of two separable states *déjà vu* (familiarity) and *déjà vécu* (recollection). Some confusion can arise because *déjà vu* is also used as the generic, catch-all phrase, but in this chapter to describe *déjà vu* and *déjà vécu* experiences collectively, or to be theoretically ambivalent, we use the generic term '*déjà* experience' (see Table 7.1 for a presentation of recollection and familiarity as applied to *déjà vu* and *déjà vécu*).

Table 7.1 Overview of recollection and familiarity

	Brain region	Subjective state	Conscious state	Contextual or source information	Associated <i>déjà</i> experience
Recollection	Hippocampus; frontal lobes	'Remembering'	Autonoetic	Some	<i>Déjà vécu</i>
Familiarity	Peri-hippocampal regions	Finding familiar or 'just knowing'	Noetic	None	<i>Déjà vu</i>

***Déjà vu* in epilepsy: a review**

The study of *déjà* experiences in temporal lobe epilepsy (TLE) has a long history, stemming from Hughlings Jackson (e.g. 1888). The involvement of the medial temporal lobe (MTL) in the aetiology of *déjà vu* and other experiential phenomena was substantiated further by use of intracortical stimulation studies throughout the twentieth century (see, for example: Halgren et al., 1978; Mullan and Penfield, 1959; Penfield and Perot 1963). In this paper, we attempt to evaluate the dual processes of recollection and familiarity in relation to TLE. In short, we seek support for the notion that *déjà* experiences can either be founded on false familiarity or false recollection. We present a review of recent studies of *déjà* experiences with almost exclusive reference to epilepsy (see Table 7.2).

Terminology and subjective report: differentiating *déjà vu* and *déjà vécu* in epilepsy

Before Brown (2003), no standard theory-driven definition of *déjà vu* existed, and therefore the terminology used in these studies varies greatly. For example, Weinand et al. (1994) formulate their own definition of *déjà vu*, including the term familiarity; Adachi et al. (1999) and O'Connor and Moulin (2008) both cite definitions by others. The phenomena described are heterogeneous: 'dreamy states' including *déjà vu*, *déjà vécu*, and memory reminiscence distinctions are described (Bancaud et al., 1994; Barbeau et al., 2005; Bartolomei et al., 2004; Vignal et al., 2007), as well as *jamaïs vu* in two cases (Fukao et al., 2005; Sengoku et al., 1997). Murai and Fukao (2003) focus primarily on *déjà vu*, but provided descriptions of paramnesia and memory disturbance. Van Paesschen et al. (2001) provide a comprehensive classification of various symptoms presented during simple partial seizures (SPS), including a category other than *déjà vu* to account for 'other experiential phenomenon such as memory flashbacks, and dreamy states (i.e. visual memories experienced as a dream)' (p.2). Sadler and Rahey (2004) and Johanson et al. (2008) discuss prescience. None of the studies describe differences in illusory feelings of familiarity versus recollection, although all of the papers by Chauvel and colleagues provide nuanced definitions of varieties of the experience and relate these back to brain structures involved in memory retrieval (Bancaud et al., 1994; Barbeau et al., 2005; Bartolomei et al., 2004; Vignal et al., 2007).

Neither do all studies document examples of patients' subjective reports of their experiences in detail, although some give quotes (Bancaud et al., 1994; Barbeau et al., 2005; Bartolomei et al., 2004; Johanson et al., 2008; O'Connor and Moulin, 2008; Sadler and Rahey, 2004; Sengoku et al., 1997; Vignal et al., 2007). The descriptions within each of these studies vary in their length, content, and detail, but common prevailing words and themes emerge: transient reminiscence of memories creating sensations of familiarity; more vivid recollection of memories; feelings that what is currently unfolding in the perceptual environment has already been experienced; and experiencing a feeling that they will know what happens next. In some cases, *déjà vu* and *déjà vécu* were classified together because they '...were considered in practice to refer to the same mental state...' (Bancaud et al., 1994, p.12).

Table 7.2 Recent research into déjà experiences in epilepsy

Source	Sample/methods	Déjà classification/ subjective report	Summary of findings	Conclusions
Stimulation studies				
Bancaud et al. (1994)	16 TLE patients: electrode stimulation, spontaneous and chemical activation (Megimide).	4-part classification of dreamy state, with <i>déjà vu/vécu</i> categorized together. p.7: what she 'sees, hears, and does' she has 'seen, heard, or done exactly the same'.	Limbic and neocortical areas both involved in dreamy states. Easier to produce from MTL. More dreamy states evoked from electrical stimulation compared to spontaneous and chemical.	Similar dreamy states evoked in same patient from distant sites, but $\approx 10\times$ more likely to evoke dreamy state from (AH) or (A) than (TN). Difficult to distinguish subjective phenomenon in (AH) and (A)—origin in either or both.
Barbeau et al. (2005)	Single patient selected from Bartolomei et al. (2004) on basis of well-described experiential phenomenon. Electrodes implanted to RTL.	Vivid memories evoked: he saw a lake, which was behind his house. He then commented, 'I go there very often'.	Two stimulations of (P) elicited subjective experiences involving generic and conceptual information from autobiographical memory. High correlation in theta range, in MTL and (PVA).	Theta synchrony between (P), (H) and (PVA) required for experiential phenomenon. Transient global network, systems correspond to subjective experience.
Bartolomei et al. (2004)	24 patients in pre-surgical evaluation. 21 with TLE; 1 with FLE; 2 with occipito-temporal epilepsy. Comparing direct stimulation of (R), (A) and (H).	DV/ <i>vécu</i> classified together as mnemonic phenomenon—contrasted to 'memory reminiscences'. Patient 3: Describes prow of a steamer on the sea associated with transient familiarity. Patient 7: Reminiscence of scene from infancy.	DV and 'memory reminiscences' more frequently induced by (R) than (H/A) stimulations <i>Déjà vu</i> linked more to (E), memory reminiscence more to (P)—these were qualitatively different to (A).	Although DV found in (R), (E) in particular evoked familiarity. Supports models of familiarity discrimination in sub (H) brain structures. Visual quality of (P) memory reminiscences ties with its links to ventral visual stream. Also supports evidence that (P) involved in context free semantic memory.

(Continued)

Table 7.2 (continued) Recent research into déjà experiences in epilepsy

Source	Sample/methods	Déjà classification/ subjective report	Summary of findings	Conclusions
Kovacs et al. (2009)	Single case report of a 22y/o (nonepileptic), reporting déjà experiences following deep brain stimulation of globus pallidus.	Neppe's (1983) definition. 'she felt that the situation seemed familiar. No visual or auditory illusions or hallucinations accompanied the DV ... the patient felt neither the ability to predict the future nor unreality about current circumstances'.	Was possible to take SPECT scans during stimulations that caused déjà experiences. These revealed hyperperfusion of right (H) and nonverbal memory was temporarily impaired.	Kovacs et al. suggest the elicited déjà experience is 'nonpathological'. No epileptic features are seen on EEG whilst case stimulated providing déjà experience. SPECT during DV revealed right-sided hyperperfusion of the hippocampus, parahippocampal gyrus, fusiform gyrus, cerebellum, and temporal superior pole, and left-sided hyperperfusion of the cerebellum, operculum, insula, lingual gyrus, precuneus, and middle temporal gyrus.
Vignal et al. (2007)	17 TLE recruited from 180 on basis of 'dreamy state' evoked from SEEG analysis. Stimulation of MTL structures interviewed during and after. Spontaneous seizure content also recorded in 5 of the patients.	Jackson 'dreamy state' definition. P1 <i>déjà vécu</i> (stimulation): '...the impression that everything around me...has already happened'.	Déjà experiences found in 14 stimulations from 6 patients. In 11 patients, 21 stimulations produced visual hallucinations of memory. Spontaneous: 4/6 patients described dreamy state; 3 <i>déjà vécu</i> , one feeling of strangeness.	Dreamy state originates from MT structures. Comparison of déjà experiences between stimulation and spontaneous experiences reveals later spread to TL prevents dreamy state. There is semiological continuity between <i>déjà vécu</i> and visual hallucinations. Network of MTL/frontal circuits implicated.
Patient surveys and questionnaires				
Fukao et al. (2005)	15 TLE; 1 FLE patient compared to 115 healthy university students on variety of DV/JV characteristics by means of questionnaire.	DV/JV constituents on questionnaire: person, place, occurrence, contents, frequency, duration, psychological condition and emotions.	Main differences found were lack of surprise during ictal DV/JV compared to controls; ictal DV/JV occurred during relaxed state, controls during physical/mental fatigue. DV occurred more in unfamiliar places for controls. Ictal DV for people unrelated to familiarity of person. Occurs more for strangers in controls.	Characteristics of DV as an ictal symptom cannot be sufficiently explained by the mechanism of false recognition that applies to normal subjects: other factors must be involved. Some differences in ictal and normal JV.

Johanson et al. (2008)	56 patients, majority (47.5%) with TLE. Content analysis performed on 262 verbal descriptions of subjective experience during partial seizures.	DV included in 'hallucinatory experiences' subscale. Instances of 'misperceived memories', e.g. 'I felt I had walked along this road before'. Prescience also linked to <i>déjà</i> experience, e.g. 'I had a strange feeling that I knew what people were going to say'.	Subjective experience during conscious part of seizure consists mostly of sensory/bodily experiences, which are visual/visceral. Mostly negative emotion. Hallucinatory experience included DV, prescience and episodic retrieval.	Emphasizes utility of combining medical objective knowledge with qualitative reports. Thus, <i>content</i> of consciousness important as well as <i>level</i> of consciousness.
Sadler and Rahey (2004)	After discovering one patient with 'Prescience' as an aura in TLE, search of 218 patients revealed 3 more with this phenomenon in TLE. Patient profile and descriptions of spontaneous ictal phenomenon gathered.	P 1: DV, then 'feels like all this has happened before'. 'At the same time I have a different feeling that I know what is going to happen next.' P 3: 'Here we go again'—'... could swear I know what they are going to say...'	Literature search failed to find publications addressing prescience. Found one case description in Gloor et al. [33] of prescience.	Prescience may be confused with DV in the literature. Prescience is closely related to DV, but subjectively different as patients claim aura is not DV.
Sengoku et al. (1997)	13 patients with recurrent dreamy states selected from 104 diagnosed as TLE. Affective content of dreamy states assessed alongside psychiatric disturbances.	Diagnostic criteria of dreamy state taken from Jackson (1879) and Wilson (1928)—classified into 3 categories: <i>déjà vu</i> , JV and reminiscence. P 1: 'déjà vu and reminiscence' accompanied by pleasure—'sensation of recollection, which feels like a scene she has experienced in the past.'	<i>Déjà vu</i> and reminiscence associated with positive or neutral affect, JV associated with ictal fear/negative affect and mental disorder.	Reminiscence and <i>déjà vu</i> closely interrelated and may be possible to classify them together due to high co-frequency. Affective content influences psychotic formation in TLE.

(Continued)

Table 7.2 (Continued) Recent research into déjà experiences in epilepsy

Source	Sample/methods	Déjà classification/ subjective report	Summary of findings	Conclusions
Structural and metabolic neuroimaging studies				
Adachi et al. (1999)	31 non-lesional TLE—14 with, 17 without déjà experiences. Interictal FDG PET used to find metabolism of DV. Factor analysis factors examined in relation to effects of DV and lateralization of EEG focus by 2-way ANOVA.	Patient's subjective reports of experiencing DV as ictal manifestation: authors cite Neppe's (1983) definition.	Metabolism in MTL and Parietal cortex sig. lower in DV patients and on the L side. Other regions had lower metabolism but not sig. No diff in DV in non/dominant hemisphere.	Side of seizure may not determine symptom, due to inter-hemispheric discharge. So, DV dependent more on relevant cerebral area than side of epileptogenic focus. Visual areas probably involved—their paralimbic connections support this thesis.
Van Paesschen et al. (2001)	50 patients with intractable TLE, 25 with normal (A), 25 with abnormal (A). Content and type of SPS examined in relation to (A) damage, assessed by MRI.	DV defined as a 'stereotypical feeling of familiarity, recognition, or reminiscence that the patient recognized as abnormal'.	Out of 17 patients reporting DV, 13 had abnormal (A). DV best predictor of abnormal (A).	Authors point to involvement of (A) in déjà experiences: Ictal onset of DV more likely to be from (A) when it is lesioned. A large number of SPS types in intractable TLE suggest abnormal (A).
Single case reports				
Milton et al. (2010)	Single case report of transient epileptic amnesia	Brown's (2003) classification.	Recovery of autobiographical memory was 'heralded' by a period of frequent déjà experiences.	Déjà experiences (authors state <i>déjà vécu</i> and cite Moulin et al., 2005) possibly reflect the recovery of retrieval mechanisms prior to complete retrieval of autobiographical events.

Murai and Fukao (2003)	Single male with TLE who experienced paramnesia as part of interictal psychosis. Case analysis—neurological examination and neuroimaging.	<i>Déjà</i> experiences as part of aura. Paramnesia similar to <i>déjà vécu</i> : 'while only a sense of vague familiarity is evoked in a <i>déjà vu</i> phenomenon, conscious recollection is experienced during his paramnesia.'	Paramnesic multiplication of autobiographical memory for period of about 4 years. Stable and consistent, and lacking insight into the appropriateness of his conviction.	Early in the course of his epilepsy, <i>déjà</i> experience auras were associated with familiarity activation, then progressed to more recollection-like. Seizure activity may have caused changes in recollection structures. Or, paramnesia is elaboration of repeated DV experiences.
O'Connor and Moulin (2008)	Single case. Suffered TLE as a result of encephalitis aged 33, experienced DV as a result of CPS. Analysis of subjective reports.	Brown's (2004) definition cited. Patient: 'It is as though it has already happened. It is as though I have lived through that period before'.	Once DV occurs, shifting attention to any other aspect of perceptual environment does not stop it.	Challenges data-driven theories of DV formation: DV was a persisting sensation of familiarity driven by TLE, applying to anything he experienced. Supports higher-order accounts.
Other				
Spatt (2002)	Theoretical article.	Neppe's definition (1983).	Discusses <i>déjà</i> experiences, nature of memory retrieval, states hypothesis and relates to experimental evidence.	Theory proposes <i>déjà vu</i> result of false activation MTL/neocortical familiarity structures. Inflexible parahippocampal mechanism works in isolation from (H).

(AH) = anterior hippocampus; (A) = amygdala; DE = *Déjà* experiences; DV = *déjà vu* (TN) = temporal neocortex; (JV) = jamais vu; (H) = rhinal cortices; (E) = entorhinal cortex; (P) = perirhinal cortex; (PVA) = primary visual area.

Classifying *déjà* experiences

First, we remove a whole category of experiences from the *déjà* experiences. Participants often report the fragmentary retrieval of scenes from remote periods (e.g. Vignal et al., 2007). Here, the dreamy state is vastly different from the healthy experience of *déjà vu*, which does not include intrusive imagery or partially retrieved visual scenes. It is difficult to classify such intrusive imagery and hallucinatory memory experiences, within a *déjà* experiences framework, since by our view, in *déjà* experiences no information is actually retrieved from memory. In *déjà vécu* there may be the illusion that contextual information in the present and a feeling of mental time-travel implies retrieval, but again, no actual memories are retrieved. There is an emergent literature on involuntary autobiographical memories (Bernsten and Hall, 2004; Schlagman and Kvavilashvili, 2008), and perhaps uncontrolled experiences of memory retrieval, such as hallucinatory memories, ought to be classified within this framework, since these are more like the Proustian, fragmentary experiences of partial retrieval described in TLE. Yonelinas and Jacoby (1996) describe automatic recollection processes in the laboratory—whereby irrelevant contextual information is produced, with the finding that it is unrelated to the recollection of central detail and the desired trace. Gloor (1990) suggests that memory phenomena in TLE can be split into those with ‘actual recall’ and those with a feeling of ‘recognition’, echoing our views here.

Returning to *déjà vu* and *déjà vécu*, the critical issue is whether the subjective reports point to recollection or mere familiarity. It is quite possible that no study has clearly distinguished between these contrasting subjective states because there has been a lack of the theoretical drive needed to dissociate them. However, in our view, the production of specifics, and the mention of various sensations and emotions in subjective reports, are indicative of a complex recollection-like retrieval process having been initiated but not resolved (such as reported in Vignal et al., 2007). Indeed, Vignal and colleagues propose a semiological continuity between vivid visual hallucinations and *déjà vécu*, which emphasizes that this state is a much more powerful sensation than a transient feeling of familiarity. This distinction was made after comparing patients who report having already experienced the scene before them, with those who reported elaborate visual hallucinations with an episodic content. Conway’s (2005) theoretical account of autobiographical memories suggests they are ‘sensory–perceptual–conceptual–affective’ in content. That is, we should look for ‘sensory–perceptual–conceptual–affective’ material in *déjà* states and, having found it, we can conclude that the experience might be one of *déjà vécu*. If retrieval is complete, or fragmentary scenes are retrieved and understood, this would be better described as a ‘flash-back’ or involuntary autobiographical memory. A priority for future research would be to classify *déjà* experiences in stimulation studies according to whether sensory–perceptual–conceptual–affective information is reproduced alongside the *déjà* experience.

Another area where *déjà vu* and *déjà vécu* may differ is prescience. Sadler and Rahey (2004) discuss prescience explicitly, and assert that it is rare and is distinct from *déjà vu*. Interestingly, the three patients they reviewed could all make a distinction in their experience between *déjà vu* and prescience. The latter sensation was accompanied by intense feelings of being able to predict what was about to happen; that they were reliving the current experience. Others describe patients feeling like that what is unfolding before them has already happened (Johanson et al., 2008; O’Connor and Moulin, 2008; Vignal et al., 2007), although these authors do not use the term prescience. For example, O’Connor and Moulin’s (2008) patient described: ‘An event will occur and I will have the sensation of knowing that the event was going to happen at that time, and I will recognize every detail of it as it happens’ (p.2). The most extreme example of ‘reliving’ events was found in Murai and Fukao’s (2003) case, who experienced the current temporally unfolding scenes as a remote 4-year period of his life. In this case, the patient would try to predict what would happen next.

A more theory-relevant account is to conceptualize prescience as the retrieval of contextual knowledge and the experience of mental time-travel, akin to recollection, rather than examine it in isolation. Certainly, the Dickens' quote above, and healthy experiences of *déjà vécu*, are both likely to contain a sense of knowing what will happen next, and therefore this dimension can be neatly encompassed into our classification of the two states. Note that merely feeling familiar with a current situation tends not to lead to the prediction of what is about to happen, since there is not the accompanying sensation of retrieval of relevant contexts and specifics, which we feel underlies the sensation of prescience; to predict what will happen next, one needs to feel one is retrieving what has gone before, not merely passively watching it unfold with a sense of familiarity. If one considers recollection from an adaptive viewpoint, its purpose is to enable mental time-travel in order to predict future events or prepare for situations based on the experience of specific past events (Addis et al., 2007). In this sense, the experience of prescience may be a direct consequence of a recollective malfunction.

Locating *déjà* experiences in the brain

The MTL is consistently implicated in the formation of *déjà* experiences (Adachi et al., 1999; Bancaud et al., 1994; Barbeau et al., 2005; Bartolomei et al., 2004; Van Paesschen et al., 2001; Vignal et al., 2007; Weinand et al., 1994). In general, these papers point to the primary involvement of the parahippocampal cortex in familiarity-based recognition (Bancaud et al., 1994; Barbeau et al., 2005; Bartolomei et al., 2004; Spatt, 2002; Weinand et al., 1994). Early on, Bancaud et al. (1994) suggested that initiation of dreamy states in limbic areas led to a co-activation of neocortical structures. Later studies also point to a network of regions involved between the MTL and neocortical structures (i.e. Barbeau et al., 2005; Bartolomei et al., 2004). Critically, Vignal et al. (2007) posit that the temporal neocortex is not necessary for the manifestation of *déjà* experiences, as an after discharge was always confined to the MTL in their patients. The most contentious issue—possibly the only contentious issue—in this literature is whether *déjà* experiences are a disturbance of the familiarity system alone (as suggested by Spatt, 2002).

A key test for our theory that some *déjà* experiences are recollective is whether brain regions believed to be involved in recollection are recruited during such experiences. For example, some authors report that the amygdala and hippocampus are both involved in *déjà* phenomena; the consistently affective content of these experiences suggesting amygdala involvement (Sengoku et al., 1997; Van Paesschen et al., 2001). Whilst discussing a nonepileptic patient, Kovacs et al. (2009) report a case of *déjà* experiences caused by deep brain stimulation of the globus pallidus. They report hippocampal and limbic structures in the *déjà* experience as indexed by single-photon-emission computed tomography (SPECT) scanning. Although the amygdala is focused on by a number of authors (Adachi et al., 1999; Sengoku et al., 1997; Van Paesschen et al., 2001), these studies did not discuss the role of this region in the context of memory encoding and retrieval.

The later stimulation studies provided the first in-depth analysis of the role of MTL structures in *déjà* experiences. For example, Bartolomei et al. (2004) found that typical *déjà vu* sensations were most likely to be elicited after entorhinal cortex stimulation (in comparison to hippocampal or amygdala stimulation). In this study, 'reminscence of memories', i.e. complete retrieval with visual imagery, was most likely to occur with perirhinal stimulation. In contrast, in a single case study, these authors (Barbeau et al., 2005) found stimulation of the entorhinal cortex could also lead to memory reminiscences of one's past, suggesting that 'recollection of vivid memory after electric stimulation of the cortex may rely on wide networks of brain areas that transiently synchronize' (p.1329). These visual memories were not, however, comprised of event-specific information, but were based on autobiographical knowledge, suggesting they were not recollective in

nature. In short, whereas initial activation of the entorhinal cortex can lead to the formation of *déjà vu*, more complex sensations, such as *déjà vécu* or retrieval of visual scenes, rely on synchronization of a larger network. Drawing on this evidence for qualitatively different experiences in distinct MTL regions, Vignal et al. (2007) explicitly discuss theories of memory retrieval. They propose a continuum of memory retrieval between *déjà vécu* (incomplete) and visual memories (complete), and find this particularly in the right temporal lobe. They describe how, when the epileptic discharge is isolated in the rhinal cortices, a ‘pure’ sensation of *déjà vécu* may occur, without any visual imagery and without an hallucinatory memory experience. In contrast, they emphasize the involvement of the amygdala, hippocampus, and ‘frontotemporal’ networks in the retrieving, or reliving, of episodic autobiographical memories.

We can make some tentative comments as to how these brain findings map onto recollection and familiarity systems and our view of *déjà vécu*. To recapitulate, Spatt’s (2002) theory of *déjà vu* cites several studies and outlines a familiarity-based account of *déjà vu* (e.g. Adachi et al., 1999; Bancaud et al., 1994; Weinand et al., 1994). He proposes that it arises as a result of false activation of mesiotemporal and neocortical memory structures, resulting in falsely labelling a scene as familiar. His theory is corroborated by the involvement of rhinal cortices in *déjà vu* formation (Barbeau et al., 2005; Bartolomei et al., 2004), areas that have been displayed elsewhere to be involved in context-free familiarity-like memory (Aggleton and Brown, 1999; Vargha-Khadem et al., 1997).

The amygdala and hippocampus are known to be involved in conscious recollection (Eldridge et al., 2000; Vargha-Khadem et al., 1997) and critically, Vignal et al. (2007) propose that the involvement of both of these, and other MTL and frontal circuits, can create the more intense and emotional hallucinations of memory, characteristic of *déjà vécu*. Our combined view is that the experience of *déjà vu* relies on a less extensive network of MTL structures, with involvement of larger networks leading to stronger sensations of retrieval, and *déjà vécu*. If the discharge is sufficient, details, visual scenes, and partial or full retrieval might be achieved. In this sense, *déjà* experiences expose part of the memory retrieval system.

A prevailing view is that the brain processes information in a ‘material-specific’ way, such that the left hemisphere is responsible for verbal material and the right for nonverbal material (Milner, 1971). Furthermore, autobiographical memory studies have suggested a laterality effect for the recollection of emotional memories, with retrieval of unpleasant, high-intensity memories being dependent on the right amygdala (Buchanan et al., 2006). The studies examining *déjà* experiences reviewed here are consistent with these observations. For example, Noulhiane et al. (2007) found the right MTL was important in reliving the encoding context of the memory and important for the visual, spatial, and emotional details of episodic memories. Moreover, the right amygdala was preferentially involved in dreamy states (Van Paesschen et al., 2001), which often elicit anxiety and negative affect. Elaborate visual hallucinations were found in the right temporal lobe (Weinand et al., 1994) and more specifically, *déjà vécu* was found in the right temporal lobe (Vignal et al., 2007). Outside the epilepsy literature, Kovacs et al. (2009) provide a comprehensive account of the treatment of hemidystonia with deep brain stimulation (DBS) to the globus pallidus. What differentiates this account from typical stimulation studies is that, on noticing DBS-elicited *déjà vu*, the authors followed up with SPECT imaging comparing DBS leading to *déjà vu* and DBS not leading to *déjà vu*. They found DBS-evoked *déjà vu* to be associated with hyperperfusion in right hemisphere MTL structures. The time-course of this analysis using SPECT is less than ideal—and an event-related methodology would better examine this idea in future studies.

Critically, the experience of auto-noetic consciousness recruits other brain regions, particularly the frontal lobes (Wheeler et al., 1997), which prompts the question of their involvement in *déjà vécu*. Patient studies converge on the idea that the frontal lobes receive input from the MTL and

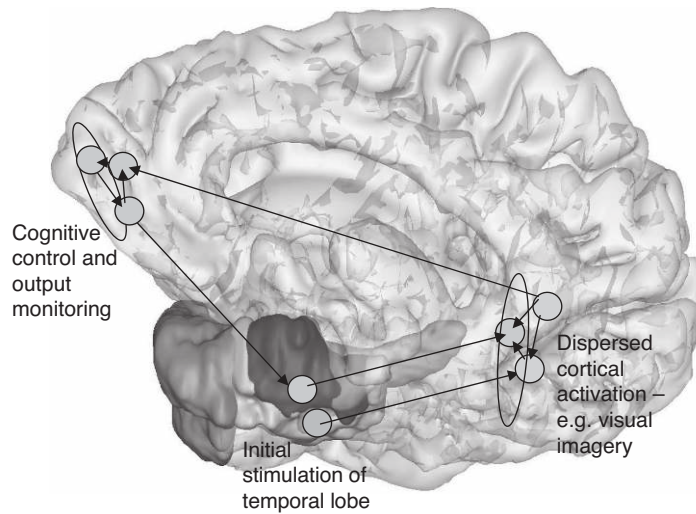


Fig. 7.2 Figure to show putative network in *déjà* states based on known memory networks. Extent of activation determines experiential state and information retrieved. Possible role of frontal lobes in generating ‘recollection’ is shown. The frontal lobes monitor the output of the temporal lobes. Frontal pathology sometimes giving rise to the perception of encoding as recollection that underlies *déjà vécu*. If activation of temporal lobe is sufficient, stimulation will lead to retrieval of information which may be experienced as a complete memory, depending on the extent of recollection, and the frontal lobes.

‘interpret’ the signal from memory regions (e.g. Moscovitch, 1994, 1992). The role of the frontal lobes in interpreting *déjà vu* is unclear, although we have previously tentatively suggested that the misinterpretation of MTL signals in the frontal lobe may be implicated in *déjà vécu* (O’Connor et al., 2010a). Of note, the recollective confabulation cases of *déjà vécu* described above do have frontal deficits. It could be the relative lack of frontal dysfunction in TLE that ensures that people with epilepsy do not act on the *déjà* experiences, and appear aware of the clash of evaluations at the core of this experience. Our neuroscientific model of *déjà vécu* builds on the above findings. We propose the ‘encoding-experienced-as-retrieval’ hypothesis, which describes faulty synchronization of theta waves between the hippocampus and neocortical areas, leading to their misinterpretation as signalling ongoing recollection rather than encoding (O’Connor et al., 2010a). With the suggestion that epileptic activity may contribute to such faulty synchronization, future research would no doubt benefit from testing such a model with TLE patients.

Certainly, with an increasing number of brain-based investigations of *déjà* experiences, a more complex picture emerges involving distributed networks of areas. For instance, Lee et al. (2009) report the case of a teenager who presented with seizures and *déjà* experiences and olfactory auras which resolved following amygdectomy. They suggest that amygdala pathology alone (as opposed to in concert with other MTL structures) is therefore capable of generating auras of this nature. It would seem unwise to consider that these mesial temporal structures in isolation can be responsible for *déjà* experiences. There is a growing interest in functional connectivity—slow-wave covariation of activation within discrete networks that is also independent of activation in other networks. Even modular units, such as the hippocampus, whose lesion results in a very clear deficit, are now being re-conceptualized as lying within far broader networks (Vincent et al., 2006), whilst regions whose involvement in higher order cognition was not previously considered, such as the cerebellum, are being implicated in networks associated with functions such as cognitive control (Krienen et al., 2009).

O'Connor and Moulin (2010) suggest four additional factors that should be considered when suggesting a causal relationship between aberrant localized activation and *déjà* experiences: (1) spreading localized activation; (2) spreading functional network activation; (3) the precise functional network in which activation is localized, and; (4) the congruence of the localized activation with the activation in the rest of the functional network:

1. Spreading localized activation is most frequently considered by those reporting stimulation studies. After-discharge to regions Y and Z neighboring region X are considered as potential causes of experience A in much the same way as region X alone, though this factor once again fails to consider the overarching role of the functional connectivity network.
2. Spreading functional network activation provides the opportunity for a more distributed set of nodes, regions Q, L, and F, which may be located in areas distant from region X, to be responsible for experience A (as globus pallidus stimulation caused contralateral mesial temporal activation in Kovacs et al., 2009).
3. The precise functional network in which activation is localized is important to consider in light of findings that the displacement of functional connectivity 'seed' regions by millimetres, even within the same brain structure, can lead to the identification of vastly different networks or the identification of differing regions on the borders of the same functional network (O'Connor et al., 2010b; Vincent et al., 2008). This is perhaps most salient when comparing activation and experiences resulting from artificial electrical stimulation in closely spaced regions.
4. Finally, the congruence of the localized activation with the activation in the rest of the functional network is potentially the most nuanced consideration. Recent studies have found that different patterns of intra-network correlations are associated with different behavioural states (Cohen and Mansell, 2009; O'Connor et al., 2010). Aberrant activation of region X may therefore differ not only when compared with baseline activation, but also when compared with the pattern of activation within other regions of the functional network. Within such a framework, the duality of the *déjà* experience is intuitively plausible; mesial temporal structures may aberrantly indicate a sensation of familiarity or recollection despite the rest of the hippocampo-cortical network (and probably frontal structures) indicating a lack of recognition.

These considerations complicate an otherwise straightforward story of activation-based causality. However, they could account for certain curiosities in brain-stimulation research, where stimulation of the same region on consecutive days results in markedly different experiences (Halgren, 1982). We therefore suggest that future neuroscientific investigation of *déjà* experiences be mindful of current understandings of functional architecture, which may also require further investigation within TLE, and possibly epilepsies with other foci.

Concluding remarks and new directions

This chapter started out with the aim of classifying the *déjà* states in TLE. To some extent this has been difficult, given the lack of consensus with regards to a definition of the *déjà* experience and the reliance on a retrospective classification of subjective reports. It is a priority to apply this classification prospectively to people with *déjà* experiences either spontaneously or under stimulation, to examine its utility. Certainly, there is some evidence in the epilepsy literature that *déjà vu* and *déjà vécu* are separable experiential phenomenon; a distinction identifiable qualitatively in the context of spontaneous and provoked epileptic activity. Moreover, the differences in their phenomenology are attributable to their functionally independent neural substrates.

If nothing else, we call for a tightening up of the terminology around *déjà vu* and the recognition memory system. For instance, Spatt's (2002) account of a parahippocampal system being at

fault in *déjà vu* (which receives a lot of support from this review) is summed up thus: ‘This memory system is responsible for judgments of familiarity. The result is that a momentary perceived scene is given the characteristics of familiarity that normally accompany a conscious recollection’ (Spatt, 2002, p.6). This quote clearly confounds the two processes of familiarity and recollection. A better phrasing might be that the scene is *given characteristics of familiarity without complete retrieval*.

In terms of brain regions, the work here suggests that parahippocampal areas are involved in the familiarity felt in *déjà vu*, but also that the more extensive the network implicated, the more complex and complete the *déjà* experience is (e.g. Vignal et al., 2007). By this view, we could see that mere familiarity results from activation of a more restricted network but with extra recruitment or after-discharge to connected areas, the more recollection-like the sensation becomes, and ultimately, partial retrieval may result and even uncontrolled visual imagery and emotional content. The idea that *déjà* experiences lie on a continuum between unsuccessful and successful retrieval is borne out in a recent case presented by Zeman and colleagues (Milton et al., 2010). They present a case of transient epileptic amnesia who experienced several intense episodes of *déjà* experiences approximately 5 years after cessation of his amnesic attacks. After these episodes he recovered autobiographical memories. Milton et al. suggest, ‘It is unclear whether the episodes of *déjà vu* directly facilitated their recovery, or represent a common outcome of a neural process which both triggered the experience of *déjà vu* and restored access to the ‘lost’ memories’.

The experimental work producing *déjà vu* in healthy subjects centres on the generation of ‘restricted’ activation of memory with the result being mere familiarity (e.g. Cleary, 2008). We echo this idea and say that within epilepsy, restricted activation of memory networks used for memory retrieval on a physiological level, also results in peculiar experiential phenomena—restricted (or artificially isolated) activation of the familiarity network would lead to *déjà vu*, and activation of a wider network, again, restricted insofar as it does not lead to complete retrieval, leads to *déjà vécu*. Thus, *déjà* experiences expose the nature of the circuitry and the ‘cognitive feelings’ associated with retrieval processes. The idea is that the conscious states surrounding memory retrieval have an adaptive nature (e.g. Conway, 2005). As such, familiarity and recollection operate to trigger, process, and guide the interpretation of cognitive operations. For instance, feelings of familiarity with a cue indicate that it is likely to be a profitable venture for the experient to initiate search strategies and attempt to retrieve more information related to the cue. As Penfield would have argued—these interpretative signals, such as familiarity, can be disrupted in the dreamy state.

On a more theoretical level, the nature of the networks involved in *déjà vu* and *déjà vécu* echo those supposedly for the separate sensations (and processes) of familiarity and recollection. In fact, there is debate as to whether familiarity and recollection lie along a continuum (e.g. Dunn, 2004; Rotello et al., 2005) or represent two distinct processes (e.g. Diana et al., 2006; Yonelinas, 1994), as assumed here. The alternative to the dual-process view is that familiarity and recollection lie on a unidimensional scale, with their differences being captured in the notion of trace strength. According to single-process accounts, high-strength memory traces can be retrieved with the sensation of recollection (or at least ‘high confidence’), whereas a low-strength memory traces elicit mere familiarity with the cue. Chauvel et al.’s studies seem to address this issue from a direct electrophysiological viewpoint. The ‘cue strength’ in these experiments could be thought of literally, as the current applied to the cortex. Therefore, even when there is a weak memory trace, a sufficiently large current (or cue) may create a false sensation of recollection. Indeed, the results suggest that the larger the initial stimulation, the more extensive the discharge to surrounding regions (e.g. Bartolomei et al., 2004; Vignal et al., 2007). This suggests a more nuanced view of the debate—cue strength at one specific point predicts the extent of activation to more dispersed and specialized circuits in concert with the original stimulated point. Thus, the 3-D

co-activation and synchronization of brain areas, seen in after-discharges leading to *déjà vécu* and intrusive visual imagery, may represent an account of how a putatively single trace can recruit multiple brain regions and mental representations to produce recollection, which, by our view, would be anatomically and procedurally separate from the sensation of familiarity. Artificially induced *déjà* experiences in stimulation studies seem an ideal test of single- versus dual-process accounts of recognition memory in humans.

Does studying *déjà* experiences in TLE bring us any closer to understand *déjà vu* in healthy people? Certainly, the experiences of *déjà vu* and *déjà vécu* in TLE are closer to those of healthy people than our previous studies of people with frontotemporal damage and dementia. Most notably, whilst the *déjà* experiences in dementia and brain injury appear largely to be anosognosic, such is not the case in epilepsy. As with healthy experiencers, people with TLE are aware of a clash of opposing mental evaluations—familiarity (or recollection) on one hand, and a lack of retrieval on the other. In the case of TLE, the most obvious explanation is that epileptic activity in temporal regions produces restricted activation of memory circuitry, resulting in a feeling of retrieval devoid of content. We have previously described this as a brain-based, top-down interpretation of the cause of *déjà vu* (O'Connor and Moulin, 2008). The extent to which *déjà* experiences in healthy people are similar rests upon whether such processes are at work in healthy people, or whether they are triggered by cues in the environment (stimulus-driven *déjà* experiences, cf. Cleary et al., 2009). The fact that *déjà vu* is experienced more frequently by people who are stressed and tired (Brown, 2003) and can be triggered by certain medications in healthy groups (Moulin and Chauvel, 2010) suggests a more brain-based account of *déjà* experiences.

Finally, some conclusions of a clinical nature. As a rule, family doctors, clinical neuropsychologists, and neurologists alike would see epilepsy as the most likely cause of an elevated level of *déjà* experiences. Other causes of the experience to a pathological degree not discussed here include substance abuse (Singh, 2007); depersonalization or derealization (Harper, 1969; Sierra and Berrios, 2000); or migraine (Sachs, 1970). Within epilepsy, if it were possible to better classify *déjà* experiences, we think that it would give some indication of whether familiarity or recollective networks were involved in the epileptic activity. Certainly, *déjà vécu*, prescience, and emotional states are, we think, indicative of a larger network being affected by epileptic changes. The clinical examination of consciousness is a contentious one (see Gloor, 1986), but possibly the forms of consciousness represented in familiarity and recollection are somewhat better specified and well-researched than others, and offer an opportunity to begin to classify the dreamy state further. This surely would have clinical repercussions in understanding the clinical manifestations of highly fractionated epileptic loci and the impact certain forms of epilepsy have on subjective experience.

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