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Imaging the future:
does a qualitative analysis add to the picture?

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Abstract

Various studies report that patients with dense amnesia experience difficulties in simulating future events. It is argued that this resembles an inability to remember past episodes in that both indicate a deficit in mental scene construction. Such findings, however, rely upon content-based analyses of participants' verbal reports. Here, samples of verbal reports produced by hippocampal-damaged participants are subjected to a qualitative, discourse analysis of how participants and researchers negotiated the status of these reports. This shows that failure in mental scene construction can be viewed as an interactional achievement rather than the mere reporting of mental events. A multi-disciplinary perspective which combines qualitative analysis with other forms of analytic technique may explain subtle differences between hippocampal-damaged participants and control participants.

Key words episodic memory; simulation of future events; hippocampus; discourse analysis; interaction

1. Introduction

The rapid expansion of clinical neuropsychology in educational, clinical and professional domains has brought with it a complementary expansion in both theory and method as they apply to this field. One important methodological technique is the collection of data elicited in the form of verbal reports produced by both patients and control subjects. Such reports are routinely analyzed by the deployment of delineated scoring techniques in which verbal content is categorized by means of coding strategies, and the subsequent output subjected to quantitative analyses. This methodological approach is an important tool, because it provides the researcher with the means of gathering information from participants that is rich, complex, and reflective of participants' own experiences. Moreover, the deployment of coding schemes and quantitative analyses enables the researcher to ensure that studies are well designed, properly executed and that their data are subjected to objective forms of analysis.

However, contemporary research in areas of study outwith clinical neuropsychology (McKinlay & McVittie, 2008) reveal that verbal material of this sort is also amenable to other, more qualitative, forms of analysis. This raises the possibility that inter-disciplinary research, in which a mixture of different analytic techniques is deployed, may provide a methodological approach which offers new insights into how to make sense of verbal material of this sort. It is this possibility which is explored in the present paper. Specifically, the aim here is to take the very first steps in an exploration of whether the use of qualitative forms of analysis might provide clinical psychologists with additional means of making sense of their data.

To pursue this goal, the present paper draws upon a previously published clinical neuropsychology study, in which participants' verbal reports were collected

(Hassabis, Kumaran, Vann & Maguire, 2007). It is important to state at the outset that the present paper is not intended as a criticism of the Hassabis et al. study itself, nor of the use of verbal reports within the field of neuropsychology in general. Rather, the aim here is to establish the extent to which qualitative analyses of the verbal reports reproduced in that paper may represent a useful methodological adjunct to more traditional forms of analyses. There are several reasons for selecting this particular previous study. Firstly, the authors were thorough enough to include in their published work specific examples of the verbal reports they collected from their participants. Second, this study is recent and has proven to be influential within the field. Third, the rigorous methodological and analytic approach adopted within this study (including the precise scoring system based on Levine, Svoboda, Hay, Winocur, & Moscovitch, 2002) provides an excellent background against which the potential contributions, if any, of more qualitative forms of analyses might be judged.

Before outlining how such an inter-disciplinary approach might proceed, it is useful to consider very briefly the theoretical and empirical background which gave rise to the Hassabis et al. study. Patients with dense amnesia have been reported presenting with difficulties envisaging their future or simulating future events (Klein, Loftus, & Kihlstrom, 2002; Rosenbaum, McKinnon, Levine, & Moscovitch, 2004; see also Rosenbaum, Kohler, Schacter, Moscovitch, Westmacott, et al., 2005, Tulving, 2005; Buckner & Carroll, 2006; and Hassabis et al., 2007). This led Schacter and co-workers (e.g. Schacter & Addis, 2007; Schacter, Addis & Buckner, 2007; Addis, Wong, & Schacter, 2007), among others, to argue that imagining future episodes shares similarities with remembering past episodes, and others, including Buckner and Carroll (2006), and Maguire and co-workers (Hassabis, Kumaran, & Maguire, 2007; Hassabis & Maguire; Hassabis et al., 2007), to maintain that scene construction

constitutes a common process underlying both episodic memory and episodic future thinking.

In both episodic memory retrieval and episodic future thinking, contextual (i.e. time and place relevant) details should be reported. Therefore, patients with episodic memory deficits should also show a deficit in imagining future episodes, since their inability to 'conjure up' details in the absence of cues should also affect prospective imagining (for a recent discussion see Schacter, Addis & Buckner, 2008).

In considering the relationship between the amnesia and ability to imagine new experiences, Hassabis et al (2007) have presented evidence which suggests that people with hippocampal lesions are worse than control participants at evoking and reporting imaginary events. As a consequence, they argue that: '... the critical attribute determining whether internally generated experiences, either real or imaginary, are hippocampal-dependent may be the extent to which they are vividly (re)-experienced.' (Hassabis et al., p.1729).

Hassabis et al. compared the performance of dense amnesic male participants with primary damage to the hippocampi on a specific task with that of ten healthy control male participants. The task required participants to imagine new experiences and to provide verbal reports of these to the researcher. Commonplace settings were selected as the scenarios for these imagined experiences. The procedure involved the researcher reading aloud a short description, such as 'Imagine you're lying on a white sandy beach in a beautiful tropical bay', and asking participants to vividly imagine the scene. Hassabis et al note that this sort of visualization of experiences 'within a rich spatial setting' differs from the sorts of simpler imagery which might be associated with tasks such as visualizing simple objects. This distinction was given emphasis in the Hassabis et al study in that participants were asked to describe the imagined scene

in as much multimodal detail as possible. Participants were told to give ‘free reign’ to their imaginations and were encouraged to visualize the situation being imagined as though they themselves were physically present in that setting. The verbal description concluded when the participant felt that he had reached a natural end or felt that there was nothing else he could add. During the process of verbal description, the researcher made use of a ‘probing protocol’ which comprised questions designed to elicit further description or elaboration. Participants’ verbal reports were recorded and then transcribed.

Subsequently, these transcriptions were subjected to a range of quantitative scoring techniques. The first of these, a measure of ‘content’, used categorical coding of the reports based on a set of researcher-defined categorisations. These categorizations coded verbal utterances into one of four classes: sensory descriptions, spatial references, entities present, and thoughts, emotions, and actions. The number of instances of each category was then calculated for each participant. In addition, quantitative ratings were also collected from participants to assess perceived sense of presence and salience of the imagined scene. Participants also reported on the perceived spatial coherence of their experiences. They were presented with a set of possible descriptors of their experiences which varied in the extent to which the experience was described as having been coherent. Based on the specific descriptors which participants selected, a quantitative spatial coherence index for each participant was then calculated. Finally, scorers estimated, on a scale of 0 – 10, the overall quality of the description provided. These different scores were then combined into an overall ‘experiential index’ which was intended to measure the overall richness of the imagined experience. Based upon these quantitative analyses, Hassabis et al. conclude that the verbal reports produced by participants with hippocampal damage evidence

impaired abilities to imagine new experiences and to combine elements of description in the process of mental scene construction (see also Hassabis & Maguire, 2007).

So contemporary trends in the study of the role of the hippocampus in memory suggest that it is important in the proper functioning of episodic memory, and that this is explained by the iconic or visual nature of such memories. Because of this, the argument has also been made that other aspects of cognition which apparently involve visual processing such as (re-)creating imaginary events may similarly prove to be hippocampal dependent.

However, it is noteworthy that this recent appeal to evidence drawn from studies in which patients with hippocampal amnesia are asked to imagine events and then describe them verbally relies upon the researcher providing an analytic overview of the nature and quality of these verbal reports. It is at this point, then, that the considerations of inter-disciplinary methodology outlined at the start of this paper become relevant. In particular, given the importance of verbal reports in this field, it is worthwhile considering whether there are potential benefits in adopting a more multi-disciplinary approach which utilises forms of analysis that go beyond content-based methods.

In pursuing this line of thought, it is useful to note that a number of researchers from outwith the neuroscience community have explored the ways in which talk and text can be understood through the application of discourse analysis techniques. The focal point of discourse analysis is the study of language in use. From this perspective, 'discourse is viewed as a phenomenon which has its own properties, properties which have an impact on people and their social interaction. One important aspect of this approach is to emphasize the way in which participants themselves have an at least implicit understanding that discourse has these properties'

(McKinlay & McVittie, p.8). So whereas content-based analytic techniques treat the verbal reports produced by participants as straightforward representations of what is being visualised, discourse analysis seeks to identify the precise ways in which such reports are built up as descriptive accounts through the careful deployment of a variety of discursive features.

The aim of the present paper is, then, to explore the extent to which a discourse analysis-based approach may contribute to an understanding of the descriptive accounts produced by participants in neuroscientific research. In this respect, the present paper seeks to establish whether a multi-disciplinary approach which draws on a range of different analytic techniques may prove useful to researchers within this field.

2. Method

2.1 Materials & Participants

The materials used in the present study are drawn from three verbal reports produced by amnesiacs and made available by Hassabis et al. (2007). Here we take these three verbal reports and subject them to a re-analysis using discourse analytic techniques. In offering this re-analysis, we aim to demonstrate the insights into participants' verbal reports that a fine-grained analysis of talk might offer beyond those provided by content-based analytic approaches. In this respect, the qualitative analysis provided here is intended not as a theoretical critique of the findings reported by Hassabis et al. Rather, the point of this re-analysis is to explore whether the introduction of interdisciplinary methodologies is a useful tactic in this field. In particular, it is important to note that the present re-analysis focuses solely on three extracts which Hassabis and colleagues made available. While this is, of course, an insufficient sample from

which to draw theoretical conclusions, it is a sufficient basis upon which to evaluate the potential usefulness of a mixed-methodology approach which draws in part on discourse analytic techniques. Of course, the corpus of verbal material from which Hassabis et al drew their examples is much larger, and so their participants will have said other things at other times. But in a sense this is irrelevant, because the point of this present example is to examine what, in fact, these particular participants said at these particular times. Indeed, the suggestion here is that if a qualitative analysis of such an extremely limited sub-set of data throws up interesting findings, then the potential for more large-scale studies of a similar sort is all the greater.

The three descriptive extracts originally presented in Hassabis et al. were responses from three participants with primary damage to the hippocampus to one or other of three different scenarios. The three scenarios were:

- Imagine you are lying on a white sandy beach in a beautiful tropical bay
- Imagine that you are standing in the main hall of a museum containing many exhibits
- Imagine that you are standing in the middle of a bustling street market

In this study, verbal reports from three of the participants taking part in the original Hassabis et al study are examined. The three participants, P03, P04 and P05, were all male and were aged 24, 58 and 70 respectively. Clinical investigations had established that in all three cases, the participants had limbic encephalitis. In all three cases, tests revealed that the participants displayed impairment on anterograde and retrograde amnesia.

2.2 *Procedure*

The extracts presented here were examined by means of discourse analysis. The term 'discourse analysis' does not describe a single method but rather has been used by a range of authors to refer to a range of different approaches, each with their own interests and concerns. (A review of these different approaches can be found in McKinlay & McVittie, 2008.) This range can usefully be viewed as a spectrum of methodological approaches. At one end of this spectrum, researchers focus on discourse understood in its broadest sense as routinized forms of communication which are influenced by ideological or structural features of society. The research emphasis here is to provide a critical account of the way in which society constrains or regulates how people make sense of their own and others' places in society (e.g. the role of racist or sexist discourses) and commonly to challenge discourse that sustains social inequalities. At the other end of the spectrum, researchers focus on discourse in a quite different way. Here, the researcher's interest lies in the way that people use discourse in their interactions with others in everyday life. From this perspective, the emphasis is on the sequential ordering of conversations and on the fine-grain detail of how discrete episodes of talk are designed in order to accomplish specific social actions which are relevant to the immediate interactional context.

In the present study, analysis was conducted using the latter approach outlined above. This form of analysis offered two particular advantages in the present case. First, it allowed attention to focus on the interactions themselves between experimenters and patients with hippocampal lesions. The focus, in line with the aim of this study, thus was on the ways in which these individuals negotiated the adequacy or inadequacy of the descriptions in the immediate context of the experimental setting. Second, it addresses what might otherwise be seen as a potential shortcoming in analyses of this sort: that such analyses lack validity and are grounded in mere

subjective interpretation. By paying careful and detailed attention to what is actually said, the analyst can demonstrate how particular elements of the interaction are relevant not just for the analyst but also can be shown to be relevant to the individuals themselves through the ways in which the interaction proceeds. The reader, by virtue of having available both the analyses and the data upon which they are based, is consequently in a position to evaluate the analyses that are offered.

In the present case, consistent with this approach, the three extracts drawn from Hassabis et al were read and then re-read on a number of occasions. The purpose of this re-reading process is to allow the analysts to become exhaustively familiar with *what* is being said in order to direct analytic focus onto the question of *how* the speaker produces his or her utterance. In general, this involves the analyst in becoming progressively aware of the subtle means by which speakers ‘design’ their utterances, such as the selection of particular lexical items or larger elements of speech including descriptive phrases, metaphors, contrasts, generalizations (or particularizations), or lists. At the same time, the analyst attends to the question of how such elements of speech are combined to produce particular descriptions of people, actions and events that might, or might not, be rhetorically persuasive.

In this particular case, this process was focused on identifying those areas of talk in which participants and researchers themselves treated the descriptive accounts being produced as though they were appropriate or not. In coding the data, therefore, particular attention was paid to identifying those elements of speech which participants deployed in order to ‘negotiate’ with each other in an ongoing fashion whether or not the descriptive account currently being produced would ‘count’ as being appropriate. Thus, for example, analytic coding paid particular attention to specific phrases which were apparently produced in order to establish that the

description being provided was derived from first-hand knowledge and was therefore especially trustworthy. Attention similarly was paid to questions which were apparently designed to achieve the opposite effect by putting in doubt the usefulness of the description that was offered. Analysis thereafter focused on the effects of these strategies, particularly upon whether or not participants' descriptions were treated as providing sufficient detail of the scenes in question and the consequences of acceptance or rejection for the interaction that followed.

3. Results

The first extract to be examined was a response by amnesic patient P03 to a cue from the researcher which asked him to imagine himself lying on a beach (researcher's utterances represented in italic text).

Extract 1

Cue: Imagine you are lying on a white sandy beach in a beautiful tropical bay

PO3: As for seeing I can't really apart from just sky. I can hear the sound of seagulls and of the sea ... um ... I can feel the grains of sand between my fingers ... um ... I can hear one of those ship's hooters (laughter) ... um ... that's about it. *Are you're actually seeing this in your mind's eye?* No, the only thing I can see is blue. *So if you look around what can you see?* Really all I can see is the colour of the blue sky and the white sand, the rest of it, the sounds and things, obviously I'm just hearing. *Can you see anything else?* No, it's like I'm kind of floating...

(Hassabis et al, 2007, p. 1727)

In Extract 1, P03 begins by stating that he can see the sky. In other circumstances, P03's claim to see only sky might have been treated as adequate, in

that someone lying on a beach might well be taken to be looking upwards at the sky. However, P03 himself prefaces his response by problematizing his account in describing himself as unable to see 'really'.

P03 goes on to provide a description of his imagined experience in terms of a three-part listing of its descriptive features. Three part lists of this sort are often included in descriptions in order to summarize some more general class of things (Potter, 1996), indicating that there is a larger set of items which the speaker could in principle draw upon in framing the relevant description. But in the present case, P03 himself precludes that normative inference by indicating that the three elements of his description exhaust the range of features which are available, in saying that 'that's about it'.

The researcher's subsequent questions are designed in a specific way. They emphasise the visual aspects of P03's experience to the exclusion of other properties such as properties of sound or touch. There are two interesting aspects of this design. Firstly, it is interesting to note that this emphasis on visual experience is in apparent contradiction to the researcher's original instructions, which emphasised the multimodal aspect of imagination. Secondly, the researcher's questions explicitly require P03 to respond with details of what he sees, despite P03's admission at the beginning of his account that he cannot really see anything. In this way, the details which P03 has already provided in terms of what he can hear and touch are in effect discounted.

Moreover, P03 frames his responses to the researcher's questions as though they are insufficient, by indicating that he can 'only' see blue and that the colour of the blue sky and the white sand are 'all he can see'. This joint working up of the

insufficiency of P03's visual experience then provides a local context which downgrades imaginings which come from modalities other than vision.

Thus, although there are details in the account which might persuasively point to events occurring in the mind's eye (or in the mind's 'ear' or in the mind's 'fingertips') P03 himself undermines this provision of detail as a satisfactory account, and both the participant and the researcher orient to what is said by the participant as an inadequate account.

In the second extract, participant P05 responds to a request to imagine himself standing in a museum.

Extract 2

Cue: Imagine that you are standing in the main hall of a museum containing many exhibits

P05: [pause] There's not a lot as it happens. *So what does it look like in your imagined scene?* Well, there's big doors. The openings would be high, so the doors would be very big with brass handles, the ceiling would be made of glass, so there's plenty of light coming through. Huge room, exit on either side of the room, there's a pathway and map through the centre and on either side there'd be the exhibits [pause] I don't know what they are [pause] ... there'd be people [pause] To be honest there's not a lot coming. *Do you hear anything or smell anything?* No, it's not very real. It's just not happening. My imagination isn't ... well, I'm not imagining it. Let's put it that way. Normally you can picture it can't you? I'm not picturing anything at the moment. *So are you seeing anything at all?* No.

(Hassabis et al, 2007, p. 1727)

A first thing to note about P05's account is that it has similarities to that produced by P03. The description P05 provides could, in other contexts, be regarded as appropriate. Like P03, he provides a listing of descriptive features which is, if anything, even more extensive than that offered by P03. Nevertheless, like P03, P05 prefaces his description by problematizing it, in saying that 'there is not a lot as it happens' and concludes his initial response by downgrading it with 'To be honest, there's not a lot coming'.

Moreover, the prompt from the researcher makes relevant potential elements of the imagined scene which have not by that stage been addressed in the account provided by P05, namely what is heard or smelt. This is similar to the case with P03, in which the description on offer is treated as being not appropriately multi-modal and hence lacking in elements of 'scene construction'. In P03's case, he reported being able to feel and hear things but was asked about what he could see. In P05's case, he reports being able to see things but is asked what he can hear or smell.

The practical upshot of the researcher's question 'Do you hear anything or smell anything' is that P05 produces a negative response which is amplified by a further undermining of his own account. This creates an interactional context in which the researcher is in a position to introduce a question which indicates the insufficiency of P05's account. The question 'So are you seeing anything at all?' makes available the inference that, to date, what P05 has said indicates that he is not seeing anything and this is represented (through the use of 'So') as a conclusion which can be drawn from the interaction to date. The strength of this conclusion is emphasised through the researcher's use of 'at all' which implies that P05 has, to date, described nothing which counts as being 'seen'.

This local interactional context is one in which P05's eventual negative response to the question can be viewed as an appropriate one. In other contexts, P05's 'No' might be heard as contradicting what he said earlier in which he described various features of the museum. But in a context where that description is treated as insufficient, P05's negative response can be heard as a locally relevant answer to the question offered. It is interesting to speculate about what the nature of the interaction would have been had the researcher asked different questions instead of 'Do you hear anything or smell anything' and 'So are you seeing anything at all'. For example, if the question had been 'Can you describe the doors/ceiling/people more' P05's response might have had a different character.

In the last extract, participant P04 produces a description of himself standing in a street market.

Example 3

Cue: Imagine that you are standing in the middle of a bustling street market

P04: Well, it shouldn't be difficult for someone who has done it for 24 and a half years [here P04 is referring to his previous job of being a market trader - see Supplementary Methods online]. The surrounding is very pleasant, it's a beautiful day. There's no bad smells, there is no dirt, which is quite unusual. Everything seems to be okay, everything is pleasant. People seem to be quite well disposed and basically there is a sense of [pause] happiness. *And if you look round what can you see?* When I look around I see people, very many people. Most of all... um... not many men, all I see are young ladies. And basically they are all in a hurry, clearly, because they would only have so much time. And... it's a precious moment. [pause] *And what does this market look like?* It could be almost any market, it could be St. Albans, it could be

Petticoat Lane, it could be the Roman Road on Saturday, it could be Leather Lane on a Friday, it could be Charter Street when the days were good. *Okay, but what does it look like to you?* Well, it could be a market in Milan. Markets have something in common which is magical and that magic can only be experienced by someone who appreciates that sort of thing. A market is a wonderful place, maybe not for everyone, but on a lovely day I think you'd find as much happiness there as anywhere.

(Hassabis et al, 2007, Supplementary material)

One immediately relevant feature of P04's account is that it differs from those offered by P03 and P05 in that instead of undermining his description, P04 works to warrant it as an authentic account of what markets look like by positioning himself as an expert, in that he was a market trader for a number of years. This is reiterated towards the end of P04's account where he indicates that the 'magic' of markets can only be properly experienced by particular types of people and by indicating that the wonderfulness of markets is not necessarily 'for everyone'. This establishes that the field of P04's expertise is not just in markets per se, but in the particular realm of experiencing markets.

However, in another respect P04's response is similar to those provided by P03 and P05 in that he provides a description of his imagined experience which in other contexts could be heard as appropriately detailed by referencing a variety of features. But notwithstanding P04's presentation of his response as an appropriately justified account, the researcher's reiteration of questions about what P04 can see indicates that P04's responses are being treated as not appropriately detailed. Given that P04 offers a somewhat lengthy description, this raises the question of the interactional relevance of the researcher's repeated questioning of what is being seen.

One possibility is that the researcher is treating a number of elements in P04's account as not 'proper' description such as his references to 'When I look around I see people' and 'they are all in a hurry'. However, in other contexts similar phrases are apparently regarded as acceptable instances of description. For example, in one of the transcripts of healthy participants' responses, the description provided includes phrases such as 'there is an atmosphere here of people moving in expectation' and 'there's a buzz about the place' (Hassabis et al, 2007, p. 1727) and these are apparently treated by the researcher as unexceptionable.

It is noteworthy that P04 relies on references to 'magic' and wonderfulness. In the first place, this indicates that the relevant features of markets are precisely those which are not readily captured by descriptions of what is seen, heard or smelt of the sort which are called for in the present task. In the second place, it indicates that only people who have the ability to experience these supernatural qualities are in a position to appreciate such descriptions. Taken together, these suggest that the experience of imagining oneself in a bustling street market requires abilities of a somewhat different kind than those involved in the task set. What this indicates is an absence of agreement between the researcher and the participant as to what constitutes a sufficient account of experience and the relevance of the task as experimentally designed.

4. Discussion

The process of reconsidering Hassabis et al.'s original data by means of discourse analyses techniques reveals that, from some perspectives, all three participants might be providing responses which in other contexts would be taken to be appropriately descriptive. The context of these interactions, however, is one in which participants

are being asked to provide a particular sort of description. In two of the cases, the participant and the researcher jointly work up these descriptions as being insufficient. In the third case, the participant acknowledges, towards the end of his account, that the description he is providing is in some sense problematic. In all three cases, therefore, within this particular context the participants apparently failed to successfully negotiate the task set for them.

So let us accept, for the moment, that the descriptions offered by the participants are in some way deficient. The question remains as to what it is that underlies this poverty in task performance. Content-based forms of analysis foreground the notion that a failure in task performance reflects acquired individual disabilities. However, the present analyses reveal that the evaluations of task performance which are generated within this experimental setting are the outcomes of a joint interactional process in which both participant and researcher play important roles. In each case, the failure does not necessarily seem solely to reflect an inability to provide details in response to the cue that is offered. It is not necessarily just the type of detail or its amount, but also the way in which it is delivered which is problematic. Information which is signalled as difficult will be treated as though it is difficult. And so the problematic status of these accounts is as much to do with failure to negotiate interactionally that the description being offered is an adequate one as it is to do with the quality of the description itself. Hence, the level of detail provided in itself does not necessarily signal an absence of scene construction. In part, it is the orientation of the interactants which marks it out as such.

So the problematic status of these accounts arguably says as much about the participants' and researchers' orientations towards the task set as it says about the potential ability to construct scenes of these participants. What this means is that in

analyzing tasks of this sort, the researcher must take seriously the communicative nature of these task interactions. This is especially important in imagery studies of the sort examined here. The temptation in such studies is to regard verbal reports of introspection as providing some sort of 'direct' inference about processes in the mind or brain. However, what the present analyses foreground is the importance of understanding that even verbal reports of this sort may be generated within a communicative episode in which what is said is the outcome of a process of interaction between participant and researcher.

Another aspect of the present analyses is that they reveal features of the participants' responses which are ignored by content-based forms of analysis. In particular, P03, P04 and P05 can all be seen to display a sophisticated understanding of the interactional requirements associated with 'telling a story'. P03 and P05 include in their responses a variety of devices which orient to their descriptions as in some way inadequate. P04 carefully designs his account to achieve the opposite effect by including descriptive detail which highlights his expert understanding of the scene that is being described. In this way, all of the participants display a well-developed ability to attend to the interactional requirements of the current context. On the one hand, they frame their responses *as* responses to the research task. On the other hand, they display sensitivity to the issue of whether their descriptions are adequate *as* descriptions.

This raises a further interesting point. Content-based analyses deal with the participants' talk by treating it as means of measuring the presence or absence of specific cognitive ability: the ability to engage in 'mental scene construction'. However, an available alternative explanation in the present case is that what participants' talk reveals is a relative inability to tell a story about what is being

imagined. On this alternative formulation, cognitive deficits which are instantiated in these participants might have as much to do with deficits in the ability to produce a story or narrative account as in the ability to inspect mental scenes (i.e. the relevant problem may be one of production rather than one of retrieval). It is, for example, interesting to note that Hassabis et al. report no significant differences among participants in the extent to which they report 'sense of presence' or 'perceived salience'. If anything, this finding would seem to support the alternative hypothesis.

This far, this paper has examined the extent to which content-based forms of analysis deal appropriately with the interactional data which are represented by the verbal descriptions jointly produced by participants and researchers. However, it is worthwhile briefly considering the other information, represented by quantitative scores, which were presented in the original paper. One noteworthy point here is that the participants' own 'spatial coherence' scores and the 'quality judgement' scores provided by scorers were lower for the hippocampal damaged participants than for the healthy participants. However, this leaves open to question whether these scores were affected by the actual performance of the hippocampal participants, by the nature of the interactions in which those participants engaged, or some combination of these factors. For example, the process of measuring the spatial coherence scores was described by Hassabis et al. as one which was 'blind to the purpose of the statements and indeed the concept of coherence' (Hassabis et al, 2007, p. 1728). However, the statements which made up the index were of the form 'I could see the whole scene in my mind's eye'. In a context where hippocampal participants' descriptions had already been worked-up as insufficient during their actual production, it would not be surprising to discover that this had an impact on the way they answered such questions.

The major focus of this paper has been on exploring the extent to which a multi-disciplinary approach to data analysis might offer anything of value to the researcher in this domain. It is important to note that what is *not* being suggested here is that researchers in clinical neuropsychology should not gather data of this sort. However, what the present study indicates is that researchers may well benefit from giving appropriate consideration to the interactional richness of this sort of data. These interactions are joint constructions, and this may influence both what is said and what is not said. For example, the ‘helpful prompts’ that follow on from open-ended questions may not be taken up by the participants in the ways expected by the researcher. One useful focus for future multi-disciplinary research therefore would be to promote researchers’ awareness of the interactional aspects of these encounters. Such development might emphasise the possible ways in which any researcher prompts, even though designed to be helpful, might be subsequently taken up in the descriptions produced by participants with hippocampal lesions and by healthy control participants.

Of course in the present instance, the research participants involved in the interactions being considered had previously been identified as having hippocampal lesions. The analysts thus were not ‘blind’ to the source of the data. In a sense, it might be thought that the analytic task thereby becomes a simpler one in that the data are already marked out as being in some way different from data that would otherwise be produced. However, in such cases the challenge to the analyst becomes potentially even greater, requiring increased attention to the ways in which variations in the descriptions are found in the detail of the interactions. The potential risk of having participants ‘pre-categorized’ is that the analyst is mistakenly drawn away from the details of what is said to more general theorizing based on what is ‘known’ about

members of such categories. (For these reasons, future inter-disciplinary research in this area might consider the advantages of performing such analyses ‘blind’, especially in cases where such analyses are performed by those who are less experienced in the intricacies of discourse analysis.)

As is the case with fine-grained discourse analysis of any data, the analytic process can be a time-consuming one that requires extensive commitment on the part of the researcher. Moreover, as we discussed in the method section, this level of researcher engagement inevitably involves interpretation in order that the most useful analysis of the data can be offered. These issues are clearly relevant to the question of whether discourse analyses of the sort produced here are applicable in the domain of neuropsychological research. However, what we hope to have demonstrated here is that, even given the potential resource costs which may be involved, such analysis of the rich data that are routinely collected could pay dividends for the neuropsychological community.

Hassabis et al. point out that the differences between hippocampal participants and healthy participants can be ‘subtle in nature’ (Hassabis et al, 2007, p. 1728). This indicates that the employment of discourse analytic techniques, which rely upon a fine-grain analysis of the subtle features of verbal interaction, might usefully be employed in exploring these subtle differences both in the development of future general theoretical understandings and in the clinical setting.

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