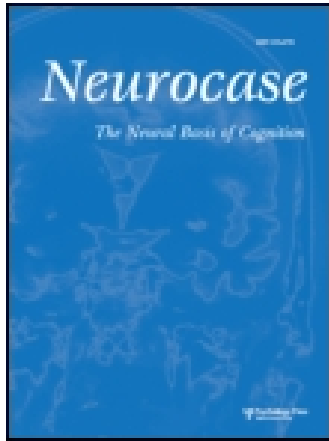


This article was downloaded by: [Aston University]

On: 27 August 2014, At: 16:17

Publisher: Routledge

Informa Ltd Registered in England and Wales Registered Number: 1072954 Registered office: Mortimer House, 37-41 Mortimer Street, London W1T 3JH, UK



Neurocase: The Neural Basis of Cognition

Publication details, including instructions for authors and subscription information:

<http://www.tandfonline.com/loi/nncs20>

Self-enhancing Confabulation: Revisiting the Motivational Hypothesis

Aikaterini Fotopoulou^a, Martin Conway^b, Philippa Griffiths^c, Daniel Birchall^d & Stephen Tyrer^e

^a Institute of Psychiatry, King's College London, London, UK

^b Institute of Psychological Sciences, University of Leeds, Leeds, UK

^c Jennie Heppell Service, Northgate & Prudhoe NHS Trust, UK

^d Neuroradiology Department, Regional Neuroscience Centre, Newcastle-upon-Tyne, UK

^e Psychiatry Department, University of Newcastle-upon-Tyne, Newcastle-upon-Tyne, UK

Published online: 11 Apr 2007.

To cite this article: Aikaterini Fotopoulou, Martin Conway, Philippa Griffiths, Daniel Birchall & Stephen Tyrer (2007) Self-enhancing Confabulation: Revisiting the Motivational Hypothesis, *Neurocase: The Neural Basis of Cognition*, 13:1, 6-15, DOI: [10.1080/13554790601160566](https://doi.org/10.1080/13554790601160566)

To link to this article: <http://dx.doi.org/10.1080/13554790601160566>

PLEASE SCROLL DOWN FOR ARTICLE

Taylor & Francis makes every effort to ensure the accuracy of all the information (the "Content") contained in the publications on our platform. However, Taylor & Francis, our agents, and our licensors make no representations or warranties whatsoever as to the accuracy, completeness, or suitability for any purpose of the Content. Any opinions and views expressed in this publication are the opinions and views of the authors, and are not the views of or endorsed by Taylor & Francis. The accuracy of the Content should not be relied upon and should be independently verified with primary sources of information. Taylor and Francis shall not be liable for any losses, actions, claims, proceedings, demands, costs, expenses, damages, and other liabilities whatsoever or howsoever caused arising directly or indirectly in connection with, in relation to or arising out of the use of the Content.

This article may be used for research, teaching, and private study purposes. Any substantial or systematic reproduction, redistribution, reselling, loan, sub-licensing, systematic supply, or distribution in any form to anyone is expressly forbidden. Terms & Conditions of access and use can be found at <http://www.tandfonline.com/page/terms-and-conditions>

Self-enhancing Confabulation: Revisiting the Motivational Hypothesis

AIKATERINI FOTOPOULOU¹, MARTIN CONWAY², PHILIPPA GRIFFITHS³, DANIEL BIRCHALL⁴ and STEPHEN TYRER⁵

¹*Institute of Psychiatry, King's College London, London, UK*

²*Institute of Psychological Sciences, University of Leeds, Leeds, UK*

³*Jennie Heppell Service, Northgate & Prudhoe NHS Trust, UK*

⁴*Neuroradiology Department, Regional Neuroscience Centre, Newcastle-upon-Tyne, UK*

⁵*Psychiatry Department, University of Newcastle-upon-Tyne, Newcastle-upon-Tyne, UK*

We report a patient who developed spontaneous confabulation following surgical clipping of an anterior communicating artery aneurysm. An autobiographical memory test was used to measure the emotional valence of the patient's self-representations in true and false memories. We found that his confabulations included significantly more positive self-representations than his true memories and that the overall valence of his confabulations was more positive than that of his true memories and than that of the memories of five healthy control participants of the same age and educational attainment. It is proposed that while cognitive dysfunction may explain how confabulations are formed, emotional factors may explain which specific confabulations are constructed.

Keywords: Emotion, valence, ACoA, memory, amnesia, prefrontal cortex

Introduction

The term confabulation refers to the production of fabricated, distorted or misinterpreted memories about oneself or the world, without the conscious intention to deceive (see also Feinberg and Giacino, 1997). Confabulations can range from simple and provoked memory distortions to spontaneous and bizarre fabrications of false autobiographical events (see DeLuca, 2000, for review). Theoretical explanations of confabulation fall within two main traditions: theories that view confabulation as a psychogenic phenomenon and theories that view it as the result of cognitive dysfunction (see DeLuca, 2000; Johnson et al., 2000, for reviews). In the first category, confabulation is explained as a product of the psychological need to "fill in" embarrassing memory gaps, satisfy the suggestions of the examiner, or deny the painful reality of brain damage (see Berlyne, 1972; Whitlock, 1981; Weinstein, 1996, for reviews). By contrast, neurocognitive models explain confabulation as a cognitive inability to: (a) retrieve memories in an organised and goal-oriented way (e.g. Burgess and Shallice, 1996; Moscovitch, 1989); (b) distinguish between memories that pertain to on-going reality and

those that do not (e.g. Dalla Barba et al., 1997; Schnider, 2003); or (c) distinguish between mental representations of various sources (Johnson et al., 2000).

More recently, we have put forward a third approach which proposes that both classes of explanation may be needed to provide a full account of the mechanism of confabulation and the nature of the resulting confabulated memories (see Conway and Tacchi, 1996; Fotopoulou et al., 2004; Solms, 2000). We propose that cognitive dysfunction may explain how confabulations are formed, while exaggerated motivational influences may explain which specific false memories are constructed and why. In psychiatry there is a long history of similar distinctions between the form and content of false beliefs (Jaspers, 1913; see Kopelman, 1997; McKay et al., 2005, for discussions). This motivational view is hitherto supported by either anecdotal descriptions (Conway and Tacchi, 1996; Solms, 2000), or measurements of confabulations produced spontaneously and thus with partial experimental control (e.g. Fotopoulou et al., 2004).

In the present study we aim to investigate the valence of confabulation under greater experimental control in a patient who developed extreme and spontaneous confabulation

We thank patient LH and his family for their participation. The study was facilitated by a grant from the British Economic and Social Sciences Research Council and the Medical Research Council to Dr Fotopoulou, as well as by an award from the Neuro-psychoanalysis Foundation to Dr Fotopoulou.

Address correspondence to Dr Aikaterini Fotopoulou, Academic Unit of Psychiatry, St. Thomas's Hospital, South Wing, Block 8, London, SE1 7EH, UK. Tel. +44 207 1880204. Fax: +44 207 6330061. E-mail: a.fotopoulou@iop.ac.uk

following surgical clipping of an anterior communicating artery (ACoA) aneurysm. We used a method deriving from studies on autobiographical memory that can elicit memories of specific self-defining value (e.g. McAdams, 2001; Pillemer, 2001). Using this method, we compared the emotional valence of the patient's true memories and confabulations, and the emotional valence of control participants' true memories. Our main hypothesis was that the false memories constructed by our patient would portray himself in more positive terms than his real memories about himself. A further aim was to establish whether these confabulations were the outcome of an *intentional* tendency to fill in memory gaps and/or satisfy the suggestions of the examiner (see Berlyne, 1972; Whitlock, 1981, for reviews), or whether they were genuine attempts to remember one's past and convey a corresponding self-representation.

Case report

LH was a 60-year-old, right-handed man with no significant previous medical or psychiatric history. He was a medical equipment salesman and local managing director of his firm. LH was travelling on business when he was urgently admitted to hospital with severe headache, nausea and vomiting. A CT angiographic investigation confirmed the presence of a small saccular aneurysm at the junction of the A1 and A2 segments of the left anterior cerebral artery which also revealed subarachnoid haemorrhage in the adjacent subarachnoid space and in the medial right frontal lobe. He underwent craniotomy and clipping of the anterior communicating artery (ACoA) aneurysm the following day. A post-operative cerebral angiogram confirmed satisfactory clipping. Figure 1 shows a CT angiographic study performed 10 days post-surgery. There was a sizeable extra cranial haematoma with evidence of recent haemorrhage and the placement of an aneurysm clip in the left paraclinoid region. There was a large acute infarction within the left frontal lobe, including both the dorsolateral and ventro-

medial prefrontal cortex. In addition, there was a smaller haematoma within the posterior aspect of the right frontal lobe and a small residual haematoma in the depth of the anterior interhemispheric fissure/septum pellucidum. Residual subarachnoid blood was noted within the mid line frontal sulci and over the convexity mainly on the left. There was also a small amount of blood in the occipital horns. Ventricles were mildly prominent. There was soft tissue swelling within the scalp tissues overlying the left frontal craniotomy.

On clinical examination 4 months post-surgery, LH's amnesia, confabulation and dysexecutive syndrome were immediately evident. LH was very talkative, hyperactive and often verbally disinhibited. He could rarely remain within the limits of given conversational topics. His answers had an almost metaphorical quality, in that he provided a relevant answer but this was set in an irrelevant context. For example, when asked what he had done the previous day, LH replied that he had been to work but it was a terrible mess. The files had been lost and the catalogue did not make sense any more. The worse thing, he said, was that others could not really help him. The information was gone, he could not retrieve it. On another occasion, when asked if he remembered who the examiner was he replied as follows: "Yes, I had to do a promotion in Durham University but the material was complicated and they brought in this Greek lass. I was showing her the catalogue, everybody else was laughing but to their surprise she understood. She is the one who introduced us, isn't she?" [at the time the examiner, who is Greek, was based at Durham University. LH was never involved in business with the University].

Neuropsychological evaluation

LH's performance of standardised neuropsychological tests is summarised in Tables 1 and 2. His IQ appeared moderately deteriorated, while his verbal and visual anterograde memory showed marked deterioration. LH made a few intrusions, mainly in the delayed recall of auditory tests. His recollection



Fig. 1. CT scan images performed 10 days post-surgery demonstrate evidence of left frontal craniotomy. There is a large acute infarction within the left frontal lobe, including both dorsolateral and ventromedial prefrontal cortex. In addition, there is a smaller haematoma within the posterior aspect of the right frontal lobe and a small residual haematoma in the depth of the anterior interhemispheric fissure/septum pellucidum. Residual subarachnoid blood is noted within the mid line frontal sulci and over the convexity mainly on the left. There is soft tissue swelling within the scalp tissues overlying the left frontal craniotomy.

Table 1. Neuropsychological evaluation of LH's intellectual and memory abilities

Test	Score	Age-adjusted level
<i>Intelligence: WAIS-III</i>		
	<i>Index scores</i>	
Verbal IQ score	93	Average
Performance IQ score	53	Extremely low
Verbal comprehension	105	Average
Perceptual organization	54	Extremely low
Working memory	75	Borderline
Processing speed	57	Extremely low
Full scale IQ score	73	Borderline
<i>WTAR estimated IQ</i>	92	
Memory tests		
<i>WMS III</i>		
	<i>Index scores</i>	
Auditory immediate memory	59	Extremely low
Visual immediate memory	88	Low Average
Immediate memory	67	Extremely low
Auditory delayed	58	Extremely low
Visual delayed	75	Borderline
Auditory recognition delayed	55	Extremely low
General memory	57	Extremely low
Working memory	105	Average
<i>Rey complex figure</i>		
	<i>Raw scores</i>	
Copy	33/36	Normal
Immediate recall	9	Impaired
Delayed recall	7	Impaired
<i>AMI</i>		
	<i>Raw scores</i>	
Personal semantic memory:		
Childhood	14/21	Borderline
Early adult life	12/21	Definitely abnormal
Recent life	9/21	Definitely abnormal
Total	35/63	Definitely abnormal
Autobiographical incidents:		
Childhood	5/9	Borderline
Early adult life	4/9	Probably abnormal
Recent life	1/9	Definitely abnormal
Total	10/27	Definitely abnormal
Other tests		
<i>Mood: HADS</i>		
Anxiety score	10	Borderline (8–10)
Depression score	10	Borderline (8–10)
<i>Semantic abilities</i>		
Pyramids and palm trees test	88.4% Correct rate	98.5%
<i>Orientation</i>		
WMS-III orientation sub-test	43% Correct rate	5 th percentile
RBMT-E orientation subtest	10.5/14	Profile score 1

of his own past was poor, particularly for recent years (Autobiographical Memory Interview; Kopelman et al., 1990). His performance on this task was also contaminated by confabulation and perseveration. LH did not appear aware of these difficulties nor of the lack of coherence in his memories. More generally, LH appeared as densely anosognosic, in that he had limited awareness of his cognitive difficulties. Occasionally, he acknowledged some problem, but minimised its importance or its self-relevance by confabulating, e.g. “Yes, I do find that over the last three four weeks I am exhausted all the time. But everybody has it. It’s a bug”. He also denied the

consequences of his impairments such as his inability to live independently or manage his finances. In order to answer such questions he used information and self-values from his premorbid life. For example, he frequently referred to his duties and responsibilities as a local area manager in order to demonstrate what he thought were his current intact abilities.

His performance was impaired on most tests of executive functions but there were some exceptions, in particular the Cognitive Estimates Test (Shallice and Evans, 1987) and the letter fluency task (Delis et al., 2001; D-KEFS) (see Table 2). LH clearly underestimated his executive difficulties relative to the beliefs of

Table 2. LH's performance on tests of executive functions

Test	Score	Age-adjusted level
Hayling test	SS 1	Impaired
DEX Questionnaire (BADS)		
LH self-report ratings	M 1.9 (SD 1.4)	Minimisation
Staff ratings	M 2.7 (SD 1.1)	
Relative ratings	M 2.7 (SD 0.9)	
Cognitive estimates	Error score: 5	Normal
D-KEFS	SS (age-adjusted)	Normative mean (SD)
<i>Trail making</i>		
Condition 4: switching	1	10 (SD 3)
Total errors in condition 4	3	10 (SD 3)
Contrasts 4 vs: motor speed	1	10 (SD 3)
Contrasts 4 vs: visual scanning	3	10 (SD 3)
Vs: combined measure of reading	8	10 (SD 3)
<i>Verbal fluency</i>		
Letter	9	10 (SD 3)
Category	1	10 (SD 3)
Switching	1	10 (SD 3)
Switching accuracy	1	10 (SD 3)
Set-loss errors	4	10 (SD 3)
Repetition errors	9	10 (SD 3)
<i>Design fluency</i>		
Composite score	8	10 (SD 3)
Switching	6	10 (SD 3)
Switching vs combined		
Repetition designs	7	10 (SD 3)
Percent design accuracy	6	10 (SD 3)
<i>Color-word interference</i>		
Naming and reading	12	10 (SD 3)
Inhibition	10	10 (SD 3)
Inhibition/Switching	14	10 (SD 3)
Inhibition errors	1	10 (SD 3)
Inhibition/Switching errors	1	10 (SD 3)
<i>Sorting</i>		
Free sorting correct sorts	6	10 (SD 3)
Free sorting description score	5	10 (SD 3)
Repeated sorts	1	10 (SD 3)
<i>20 Questions</i>		
Initial abstraction	7	10 (SD 3)
Total questions asked	7	10 (SD 3)
Weighted achievement score	8	10 (SD 3)
<i>Word content</i>		
Total consecutively correct	2	10 (SD 3)
<i>Tower</i>		
Total achievement score	6	10 (SD 3)
Mean first-move time	12	10 (SD 3)
Total rule violations	9	(percentile rank)
Rule-violations-per-item ratio	7	10 (SD 3)
<i>Proverb free inquiry</i>	4	10 (SD 3)

his relatives and staff as illustrated by his scores in the Dysexecutive Syndrome Questionnaire (Wilson et al., 1996; BADS).

LH's mood ranged from apathy to occasional, sudden episodes of agitation. Despite his apparent apathy, his depression and anxiety scores were marginal on a self-report mood assessment questionnaire (Zigmont and Snaith, 1983; HADS, Table 1). Care staff reported that LH was unmotivated to participate in rehabilitation activities, a stance which was embedded in confabulatory belief systems. For instance, he claimed he was in a holiday resort in Australia and he treated the staff accordingly.

During assessment, LH often spontaneously described lengthy fictitious events that included fragments of real experiences, as well as elements of his thoughts and inner needs. For instance, in sessions preceding his lunch he often mentioned his hunger and then immediately went on to describe relevant false events such as the opening of a new canteen in the area. On another occasion he began to treat the examiner as a waitress and asked what was on the day's menu. When the examiner questioned him, he was often either hungry, or thirsty. In the face of such pressing needs, LH apparently employed elements of past self-representations to contextualise them. For example, in wanting to leave the ward, he often claimed he had an important business meeting to attend, or that his car was parked just outside and he had to move it immediately or he would be fined.

It thus appeared clinically that LH produced mostly wishful and self-enhancing confabulations. In order to substantiate this clinical impression, two experimental studies were conducted.

Experimental investigations

Control participants

A control group of five neurologically healthy adults were recruited. These were males with approximately the same age and educational ability as LH, mean age of 57.8 (2.2), ranging from 56 to 61 years, and mean education of 13.6 (2.3) years. Written consent was obtained for all participants. The study was approved by the local NHS Trust's Ethical Committee.

Study 1: True and false self-defining memories

The main aim of this experiment was to examine whether the specific confabulations constructed by our patient portrayed a self-representation that was more positive than that depicted in his true memories. "Self-representation" was defined as the knowledge one has about oneself, e.g. the events of one's life history, character traits, physical appearance, relationships with other people, role in society etc.

Materials and procedures

We used a modified version of the McAdam's (1985) life story technique to elicit self-defining autobiographical memories (McAdams et al., 2001). LH and the controls were asked to

describe 12 self-defining events, including a particularly pleasant experience (high point), a sad experience (low point), a turning point in their life, their earliest memory, an important childhood event, an important adulthood event, a recent important event, an important event from any lifetime period, a memory that displayed something stable about the self, a decision-making memory, a memory of an important moral dilemma and a goal memory. The resulting memory protocols were coded for their content by two raters, blind to both the hypothesis and the groups of the study, who were previously trained in the coding system (Fotopoulou, 2005). They were given the protocols in random order, as “protocols of true and false memories produced in psychological interviews” with the first author. Separate interviews were held with participants’ relatives and staff, who provided corroborative information for every memory protocol.

Statements to be coded were sequences of phrases or sentences that described a single thematic content. All statements included in the confabulation protocols were coded, as it was considered arbitrary to separate accurate statements from the “confabulated” context in which they were recalled. Multiple memories were also scored as it was not always possible to separate their limits (see Levine et al., 2002, for an alternative approach), and more generally we felt that given the complexity and often semantic obscurity of confabulatory protocols, the experimenters should not apply arbitrary criteria of exclusion but rather allow the patient to determine the limits of his memories. This of course could lead to differences between controls and LH, but in this way these differences could be observed rather than masked by experimentally induced uniformity (see also Fotopoulou et al., 2004). For the same reasons, repetitions (per-severations) of statements were scored only once, but only when obvious, or when acknowledged by the patient himself. Two main categories were coded. These were (1) Overall valence of memory and (2) Self-representation valence.

1. The overall emotional valence of each accurate or confabulatory account was measured on a five-point scale: 1 = negative; 2 = emotional shift from positive to negative; 3 = neutral; 4 = emotional shift from negative to positive; 5 = positive. Emotional shift ratings were included as investigations into autobiographical memory have shown that such shifts are both frequent in personal narratives and central to the formation and expression of one’s self-representation and identity (for review see McAdams, 2001). These shifts were defined as “explicit transformations in the story from a decidedly negative affect state to a decidedly positive-affect state” and vice versa (McAdams et al., 2001). The original affect state had to be explicit and the transformation could include either a change to an affect state of the opposite valence, or the production of an outcome with the opposite affect state. For example, LH described that as a young child he was very attached to his mother, not very strong-willed and picked upon by his classmates. Following her death he felt totally devastated but his sorrow helped him build a

strong personality and he progressively gained the admiration of his class mates.

2. Self-representation rating included any statements explicitly providing information about the “self” and its position in interpersonal relations (e.g. “I never had any high sights”, or “I always gave my family everything”). In this scoring category the self-representation could be scored with regard to its emotional valence, i.e. negative, positive, or neutral (neutral, ambivalent or hard to evaluate) and its agency, i.e. “self” as active/responsible (e.g. one who cares for others) or “other” as active/responsible and “self” as passive (e.g. one who is supported by others).

Study 2: Intentional confabulation

The aim of these studies was to examine whether LH’s confabulations were the result of his intentional efforts to fill in memory gaps, or comply with the suggestions of the examiner.

Confabulation and gap-filling

In order to assess whether LH’s confabulation was explicable by a gap-filling tendency, the “Dalla Barba Confabulation Battery” (1993) was administered. This test consists of six subsections of questions (see Figure 2). The last two sections include questions—the answers to which are generally unknown, e.g. semantic memory: “What was the profession of Marilyn Monroe’s father?”, episodic memory: “How did you spend Christmas Day on 1985?”. If LH’s confabulations were explained by a gap-filling tendency more confabulations should be produced when these questions were posed than in the other sections. Answers were recorded *verbatim* and confabulations were scored using Dalla Barba’s (1993) criteria.

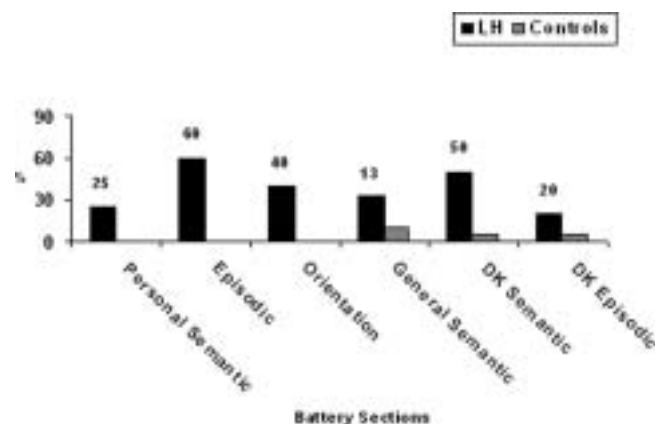


Fig. 2. Percentage of confabulations by LH in the confabulation battery. *Note:* Memory sections: Personal Sem, Personal Semantic; Orientation, Orientation in Time and Place; General Sem, General Semantic; DK Semantic, Do not know Semantic; DK Episodic, Do not know Episodic.

Confabulation and suggestibility

The Gudjonsson Suggestibility Scale (GSS1) (1997) was used to assess LH's potential tendency to provide answers according to external suggestion. This scale comprises a narrative paragraph, which the participants have to recall. Following this, 20 questions related to the story (15 suggestive [i.e. misleading] and five non-suggestive [i.e. based on the story]) are asked. The 20 questions were then asked a second time, following clear negative feedback (the patient is explicitly told that he gave many wrong answers the first time), and positive answers on these questions are scored as "Yield 1" (giving in to suggestive questions) "Yield 2" (giving in to suggestive questions following negative feedback), "Shift" (number of times subjects change their answers following negative feedback) and "Total Suggestibility" (Combined scores of Yield 1 and Shift). Gudjonsson's (1997) scoring criteria were followed.

Results

Study 1

Controls produced 12 accurate memories each (as defined by corroborative information), although some of their memories were less coherent and specific than others. LH produced seven accurate memories and five confabulations. In order to compare the accurate accounts produced by LH during the interview with an equal number of confabulatory narratives, the first two spontaneous self-referential confabulations produced by LH in the same week were corroborated and included in the comparison. The two independent raters agreed on 92% of the selected items to be coded and 98% of the specific classifications made. Their remaining differences were resolved by discussion.

Overall valence

The overall valence of the memories of the control participants showed a mild positive bias ($M = 3.4$; $SD = 0.1$), while LH's accurate memories ($M = 2.7$) were significantly more negative ($t = 6.4$, $p < 0.01$; Crawford and Howell, 1998). In contrast, five out of LH's seven confabulations were rated as pleasant, or as ending in pleasant conditions for LH; their mean valence ($M = 3.9$) was significantly more positive than that of the controls ($t = 4.6$, $p < 0.01$; Crawford and Howell, 1998). Moreover, it should be noted that LH's two negative confabulations referred mostly to fabricated reasons for his admission. Although the confabulated memories are unpleasant as scored, they are actually "pleasant", if one considers the "reality" to which they correspond, i.e. the true reasons for admission. For example, the patient stated that he was sent to the hospital because he had some pens to deliver for the "morning art session" and that he has been "in their hands ever since".

Valence of self-representation

There was an overall difference between the amount of self-representations mentioned by controls and that mentioned by LH in his confabulations and his true memories (χ^2 ($df = 2$) = 8.1, $p < 0.05$). Non-parametric *post hoc* tests (Bonferroni corrected) revealed that the number of self-representations mentioned by LH in his confabulations (56 different references) were significantly greater than the number of self-representations mentioned by the controls (41 representations on average across 12 memories; $Z = 2.6$, $p < 0.01$). Confidence limits on this result were calculated using a *t*-test calculation developed specifically for case studies ($t = 4.4$, $p < 0.05$; Estimated percentage of normal population falling below individual's score = 99.42%; 95% lower confidence limit on the percentage = 93.70%; Crawford and Howell, 1998). No other difference was significant (p values > 0.1). This frequent self-referencing in LH's confabulations may relate to the fact that the latter included only a few contextual details of the narrated events and instead centred on specific ideas he apparently wanted to convey about himself (see Example below). The described events and facts appeared as a random background to the self-related ideas on which LH focussed. In addition, unlike controls, who narrated social occasions such as relatives' weddings and the birth of children, etc., he never placed the focus of a memory on anybody but himself.

His confabulations further seemed to convey a preoccupation to describe himself in positive terms. Indeed, LH's confabulations contained significantly more positive than negative, or neutral self-representations than his true memories (χ^2 ($df = 2$) = 13.9, $p < 0.001$), and marginally (not reaching significance) more positive than negative, or neutral self-representations than the true memories of the controls (χ^2 ($df = 2$) = 4.2, $p = 0.06$). Most of these self-enhancing themes related to his determination and achievements in life, his recognised authority and his superior intellectual abilities. Although these values featured in his true memories (see below), in his confabulations they were retrieved more frequently and in irrelevant context. Moreover, as his relatives also noted, these positive values were grossly exaggerated and had overshadowed other, less positive, components of his premorbid self-representation. Interestingly, LH rarely expressed positive feelings toward others, such as sympathy, concern, or longing, in his true or false memories. Finally, similarly to controls, LH focused more on active and responsible self-representations (e.g. achieving goals, loving or misbehaving towards others) than passive ones (e.g. being loved or hurt by others). These findings are summarised in Table 3.

In his confabulations LH described himself as "superior" to others and he appeared frustrated at others' "lower intellectual" or other abilities and he repeatedly described how he had "set the record straight", had established his authority and had achieved what he wanted once he had taken control of the situation. He persistently misused, misinterpreted and wrongly combined events from his past to contextualise these self-congratulatory thoughts and feelings. The example

Table 3. Percentages of self-representations in true memories and confabulations

Agency	Valence	LH's confabulations	LH's true memories	Controls' true memories
		% ¹	% ²	% ³
Self	Positive	42.8 ⁵	21.4 ⁴	38.8 (SD 6.7)
	Negative	28.6 ⁵	40.5 ⁴	24.4 (SD 6.4)
	Neutral	5.3 ⁵	14.3 ⁴	12.9 (SD 5.7)
Other	Positive	8.9	7.1	9.8 (SD 7)
	Negative	12.5	11.9	11.7 (SD 3.9)
	Neutral	1.8	4.7	2.3 (SD 2.5)

¹Percentage of the total number of self-representation statements in LH's confabulations.

²Percentage of the total number of self-representation statements in LH's true memories.

³Percentage of the total number of self-representation statements in controls' true memories.

⁴Significant differences compared with controls ($\chi^2(2)=9.9, p < 0.01$).

⁵Significant differences compared with LH's true memories, ($\chi^2(2)=13.9, p < 0.001$).

below is characteristic of both his positive self-representation and the disorganisation of his recall.

Confabulation Example

Decision-Making Event: There's all sorts of things. Important decisions ... I elected which way I wanted to go in life, and I've done it. And it's proved out to be a bit of a hassle. Because these are people who aren't particularly bright. I mean I don't think it is my arrogance, they might be, but I don't think they're as bright as me ... get above me. And, they come up with the most ridiculous things. And since me last birthday I thought, ah, I've really had enough of this. So I started to be a lot more honest with people and tell them what I think of what they're doing. But actually, they all say how grateful they are I've done that. [Hm.] Because they're so inexperienced. The danger comes when they think they are experienced and they want to do the same bloody thing. [So do you remember any more details about the day you took such a decision? What happened?] Oh ... to be totally honest? Fairly recently, actually. Probably about ten years ago. But, in the first place, to be devious and do the job. It'd be ... probably right at the end of me teens. About, sort of, 19 to 21, that sort of area. Um, now ... it's a lot easier, but people absolutely hate me for it. Because I regularly – well, they think I'm kicking against the pricks. Telling them what I think of their decisions. Because if they blew me out now, I could just write a cheque and pay me mortgage off. The house is mine. Um ... and in the worst scenario you know, I could live. But, the problem is, particularly when – what the hell is the company called? What were we before we became what we are now? And I can't remember what we're called now, either. I've never bothered to look at it. Um... see, that was a mess. The company was a mess. It came so close to closing down, it was just unbelievable. I think I told you it took the third telephone call in one morning to stop the company being closed down. Uh ... (looks perplexed). [You were talking about the decision you took to ... interrupted by the patient:] It's easier to talk about the company, you see. *Laughs*. [I see].

[Corroboration Notes: LH's hospitalisation coincides with his "last birthday". It is true that LH is more "outspoken" since that time but this could hardly be described as

honesty and it was definitely not the result of his decision. Some of his other associations have kernels of truth in them but are hard to understand, for example his company was indeed recently bought by another company and thus changed name. His family is not aware of any other period when he claimed he took the decision of becoming more honest, or more critical of others]

In LH's accurate memories he portrayed himself and his relationship with others in more negative terms than the control subjects did ($\chi^2(2) = 9.9, p < 0.01$) (Table 3). However, it is noteworthy that although LH remembered many unpleasant events and described several negative self-representations in his accurate memories, he typically ended his narration by describing how he overcame the difficulties and how he benefited from such experiences ("redemption narratives" see McAdams et al., 2001). He gave similar answers to questions about a sad event (how his mother's early death made him stronger, see above), an early adulthood event (how a first negative experience with a girl taught him a lesson), a moral dilemma (how he took the right decision in dealing with a difficult moral situation in his family), and an event that shows self-continuity (how he had become lazy because his intellectual abilities had always been greater than those of others).

Study 2

The performance of LH and the control subjects across the sections of the Dalla Barba Confabulation Battery is summarised in Figure 2. LH confabulated across all the sections of the battery; more often he confabulated when answering episodic questions, orientation questions and "Don't know" semantic questions. Interestingly, LH confabulated less in episodic "don't know" questions and seemed to realise their difficulty.

The performance of LH and the control subjects on the Suggestibility Scale is summarised in Table 4. As expected, LH's immediate recall scores were abnormal in comparison with the means of the general population (Gudjonsson, 1997).

Table 4. LH's performance on the Suggestibility Scale

Suggestibility Scale GSS1	LH (percentile)	General population norms	Intellectual disabilities sample (IQ 57–75)
Immediate recall	8 (5 th)	21.3 (7.1)	7.3 (4.5)
Delayed recall	–	19.5 (7.5)	5.9 (4.5)
Yield 1	9 (90 th)	4.6 (3)	7.1 (4)
Yield 2	12 (90 th)	5.6 (3.8)	8.5 (4.4)
Shift	5 (75 th)	2.9 (2.5)	5.0 (3.6)
Total suggestibility	14 (90 th)	7.5 (4.6)	12.1 (6.2)
Distortions (immediate)	1	1.15 (1.2) (GSS2)	
Distortions (delayed)	–	1.26 (1.8) (GSS2)	
Fabrication (immediate)	1	0.4 (0.7) (GSS2)	
Fabrication (delayed)	–	0.5 (0.7) (GSS2)	

Note: GSS1, Gudjonsson Suggestibility Scale Version 1; GSS2, Gudjonsson Suggestibility Scale Version 2.

His initial Yield scores were abnormally high (partly explicable by his poor memory). His Shift score, which was 5, (range for normal subjects 2.9; $SD = 2$, see Table 4) indicates that negative feedback and repeated exposure to distracting information had a limited influence on his answers. His Total Suggestibility score was not within the normal range ($>1 SD$ and $<2 SD$ of normal controls), but was within the range of individuals with intellectual disabilities (IQ 57–75). Thus, his scores on the Suggestibility measures indicate that his responses to memory questions did “yield” to external suggestion but not to the degree expected, as defined by the available normative data for individuals with similar IQ level and as expected given his memory deficits.

Discussion

This study examined whether the false memories constructed by our patient would portray a representation of himself that was more positive than the corresponding self-representation depicted in his own real memories. Our findings confirmed that LH referred to his self-representations more frequently than in his accurate memories and significantly more frequently than controls referred to themselves in their accurate memories. Moreover, LH's confabulations were more positive in overall valence and they included more self-enhancing self-representations than his true memories. In a previous case report we found that the content of spontaneous confabulation often features a positive emotional bias (Fotopoulou et al., 2004). The present study confirms this finding under tighter experimental control and provides further details of the nature of these self-related biases in confabulation. Specifically, LH's confabulations seemed to portray a self-representation which predominately relied on the exaggeration of premonitory values of self-esteem, positive character traits and professional competence. The latter were also present in his accurate memories but to a lesser degree. These “positive” features (Jackson, 1932) of the content of LH's confabulations could not be explained solely by his cognitive impairments.

The role of these impairments in producing confabulation, as well as the role of conscious or unconscious motivational factors in shaping the content of LH's specific confabulations, are discussed further below.

Neurocognitive deficits

LH's neuropsychological profile was characteristic of that shown by most other confabulating patients (see Deluca, 2000; Johnson et al., 2000, for reviews). He showed severe memory and executive functions impairment. The latter included disinhibition, perseveration, and lack of flexibility, abstraction and self-monitoring. This profile is consistent with the “retrieval deficit” account of confabulation (e.g. Burgess and Shallice, 1996; Moscovitch, and Melo, 1997). A somewhat surprising finding was LH's relatively good performance on two tests of reasoning (Cognitive Estimates and 20 Questions Test) and one test of problem solving (Tower Test). In some retrieval models, such functions have been linked with more “bizarre” and “fantastic” forms of confabulation (e.g. Burgess and Shallice, 1996). LH showed such confabulations (e.g. his bizarre narratives about his reasons for admission), yet he did not present with such deficits. Moreover, LH showed reduced motivation and problematic social conduct. This pattern is not uncommon and is associated with lesions of the ventromedial prefrontal cortex (e.g. Bechara et al., 2000; Berlin et al., 2004), that receives its blood supply from the anterior cerebral artery and associated vessels. His confabulation was more frequent in the episodic memory domain and in orientation questions, but was not restricted to these domains (see also Dalla Barba et al., 1997; Fotopoulou et al., 2004; Kopelman et al., 1997).

Self-enhancing content

LH retrieved fragments of previous memories and current thoughts in a poorly organised, incoherent, and inconsistent fashion (Conway and Fthenaki, 2000; Kopelman et al., 1997;

Moscovitch and Melo, 1997). Nevertheless, the consistently self-enhancing content observed in LH's confabulations could not be explained by a "retrieval deficit" account without presupposing complementary emotional mechanisms (see Fotopoulou et al., 2004, for further discussion). For example, the Burgess and Shallice's account of confabulation (1996) could explain how the highly generic nature of self-related themes may render them easier candidates for recollection and thus increase their presence in the content of confabulations (see also Conway, 2005; Dalla Barba et al., 1997; Gilboa et al., 2006). However, these models cannot explain why such self-reference is positive and self-enhancing unless they refer to normal or exaggerated emotional influences, as these are observed in other studies of normal autobiographical memory (see Conway, 2005, for review; see also below).

Alternatively, the observed emotional bias could be accounted for by explanations which propose that confabulation represents the conscious attempt to hide memory gaps, and fill them in with information constructed *ad hoc*, or with information which might satisfy the suggestions of the examiner (see Berlyne, 1972; Whitlock, 1981, for reviews). However, LH showed only minimal confabulation in episodic memory questions for which he did not know the answer (see also Mercer et al., 1977; Moscovitch and Melo, 1997; Schnider et al., 1996). Additionally, he showed only mild suggestibility, consistent with his intellectual and memory difficulties. These results are also consistent with observations of his spontaneous behaviour. LH's confabulations often appeared independently of leading efforts and prompts, i.e. they were spontaneous rather than provoked (Kopelman, 1987). LH was unaware of his cognitive difficulties and thus his confabulations could not represent conscious attempts to compensate for memory loss. In addition, they were at times accompanied by corresponding actions or intentions for action (see also Schnider et al., 1996). Also, both LH and his relatives described his premorbid personality as highly assertive and rather resistant to suggestion. It is therefore unlikely that gap-filling and suggestion had a primary causative role in LH's confabulations. More likely these factors contributed only to the production of secondary confabulations, which aimed to provide support for his original confabulations (see also Moscovitch, 1989).

We propose that LH's self-enhancing confabulations can be best explained as the product of exaggerated motivational influences on autobiographical memory construction. Autobiographical memory allows individuals to construct an organised and continuous sense of self in time (e.g. Conway, 2005; McAdams, 2001; Neisser, 1988; Nelson, 2003). These self-representations are formed according to both cognitive abilities and motivational factors (Conway, 2005). When brain dysfunction and cognitive deficits impair the ability to form autobiographical memories, self-identity and the sense of self-continuity are also compromised (see also Conway and Fthenaki, 2000). The self-representation of confabulating patients is no longer constrained by true self-defining autobiographical events (Conway and Tacchi, 1996; Fotopoulou et al., 2004; see also Johnson and Raye, 2000, for discussion), or the realistic appreciation of their current condition (see Schnider, 2003). LH's case further suggests

that against the background of memory and executive disorganisation, his self-representation was constructed under the exaggerated influence of motivational factors, particularly premorbid self-regard, previous strategies of coping with stressful situations and present needs and goals. LH appeared to unconsciously combine self-enhancing elements of his autobiography and parts of his wishful thoughts to create a highly self-congratulatory memory collage, albeit incoherent and falsely rooted in reality.

Thus, it appears that motivational factors continue to have an influence on autobiographical memory construction. They may even be exaggerated because of the cognitive dysfunction that arises due to damage to the ventromedial prefrontal cortex (see Conway and Fthenaki, 2000; Johnson et al., 2000), as well as because of the unpleasant situation in which patients find themselves after brain injury. Indeed, given LH's devastating brain damage, motivational mechanisms of self-esteem enhancement may have become more pertinent. It should be noted that LH's accurate memories were more negative than his confabulatory ones, which in turn were more positive than those of the controls, even though they contained only marginally more positive self-representations than those of the controls. These findings suggest that he may have been more affected by his predicament than it appeared. In other words, his accurate memories may have represented successful and mood-congruent retrieval attempts (see also HADS results), while the content of his confabulations may have been under the influence of positive self-serving emotions, which were not founded in current reality but which permitted him to "escape" the unpleasantness of his accurate self-representation by retrieving pleasant, yet false, versions of it. Often this seemed to take place by providing pleasant but false endings and interpretations to unpleasant narratives, or by placing self-enhancing ideas and thoughts in an irrelevant context.

Interestingly, LH's pre-morbid behaviour suggested that he had always been someone who has tended to inflate his abilities and importance, particularly when undergoing stressful and self-threatening periods. In future studies it will be interesting to also assess non-confabulating patients with ventromedial frontal lesions in order to specify the exact contribution of these lesions to self-enhancing confabulation versus that of the premorbid personality and the coping strategies of patients. Although previous studies have shown that frontal non-confabulating patients show affective and behavioural disinhibition, as well as disorganised retrieval, perhaps future studies can explain why confabulating patients with similar lesions not only retrieve and narrate false self-enhancing events, but also accept them as part of their autobiography and experience them with similar recollective quality to their true memories (Ciaramelli et al., 2006; Dalla Barba, 1993). Based on this case-study, we argue that confabulations are constructed according to an increase in motivational self-enhancement needs and an impairment in the executive control of memory, which allows these motivational influences to dominate memory formation and create self-congratulatory false memories.

In conclusion, these findings suggest that the normal tendency to construct self-enhancing autobiographical memories

may be exaggerated in confabulating patients. This is thought to be caused by the memory and executive dysfunction that mediates the construction of confabulations in the first place. In other words, confabulations could be described with reference to what is missing, that is, the appreciation of current reality and the appropriately organised retrieval of the past. Most crucially, they could also be described by what remains, that is, the dominance of premorbid self-values and current inner drives and goals. The case of LH highlights the dynamic interaction of cognition and emotion in memory construction. Brain damage that affects one's autobiographical memory, and hence the construction of one's self-representation, is likely to have both cognitive and motivational consequences.

Original manuscript received 29 June 2006
Revised manuscript accepted 6 December 2006
First published online 19 February 2007

References

- Bechara A, Damasio H, Damasio AR. Emotion, decision making and the orbitofrontal cortex. *Cerebral Cortex* 2000; 10: 295–307.
- Berlin HA, Rolls ET, Kischka U. Impulsivity, time perception, emotion and reinforcement sensitivity in patients with orbitofrontal cortex lesions. *Brain* 2004; 127: 1108–26.
- Berlyne N. Confabulation. *British Journal of Psychiatry* 1972; 120: 31–9.
- Burgess P, Shallice T. The Hayling and Brixton Tests. Suffolk: Thames Valley Test Company; 1997.
- Burgess PW, Shallice T. Confabulation and the control of recollection. *Memory* 1996; 4(4): 359–411.
- Ciaramelli E, Ghetti S, Frattarelli M, Ladavas E. (2006). When true memory availability promotes false memory: Evidence from confabulating patients. *Neuropsychologia*, 2006; 44: 1866–77.
- Conway MA. Memory and the Self. *Journal of Memory and Language* 2005; 53: 594–628.
- Conway MA, Fthenaki A. Disruption and loss of autobiographical memory. In: Boller F, Grafman J, editors. *Handbook of Neuropsychology*, Vol 2. 2nd ed. Amsterdam: Elsevier Science; 2000: 281–312.
- Conway MA, Tacchi PC. Motivated confabulation. *Neurocase* 1996; 2(4): 325–38.
- Crawford JR, Garthwaite PH. Investigation of the single case in neuropsychology: Confidence limits on the abnormality of test scores and test score differences. *Neuropsychologia* 2002; 40: 1196–208.
- Crawford JR, Howell DC. Comparing an individual's test score against norms derived from small samples. *The Clinical Psychologist* 1998; 12: 482–6.
- Dalla Barba G. Confabulation: Knowledge and recollective experience. *Cognitive Neuropsychology* 1993; 10(1): 1–20.
- Dalla Barba G, Cappelletti YJ, Signorini M, Denes G. Confabulation: Remembering “another” past, planning “another” future. *Neurocase* 1997; 3:425–436.
- Delis DC, Kaplan E, Kramer JH. Delis-Kaplan Executive Function System. San Antonio, TX: The Psychological Cooperation Harcourt Assessment Company; 2001.
- DeLuca J. A cognitive perspective on confabulation. *Neuro-psychoanalysis* 2000; 2(2): 119–32.
- Feinberg TE, Giacino JT. Confabulation. In: Feinberg TE, Farah MJ, editors. *Behavioural Neurology and Neuropsychology*. 2nd ed. New York: McGraw-Hill, 1997: 363–72.
- Fotopoulou A. Confabulation: Constructing Motivated Memories. Durham: PhD Thesis; 2005.
- Fotopoulou A, Solms M, Turnbull O. Wishful reality distortions in confabulation: A case report. *Neuropsychologia* 2004; 42(6): 727–44.
- Gilboa A, Alain C, Stuss DT, Melo B, Miller S, Moscovitch M. Mechanisms of spontaneous confabulations: a strategic retrieval account. *Brain*, 2006; 129(6): 1399–414.
- Gudjonsson GH. The Gudjonsson Suggestibility Scales. Manual. Hove, UK: Psychology Press; 1997.
- Jackson JH. Evolution and dissolution of the nervous system. In: Taylor J, editor. *Selected Writings of John Hughlings Jackson*, Vol. 2, Reprint. London: Staples Press, 1932: 45–75.
- Johnson MK. Reality Monitoring: Evidence from confabulation in organic brain disease patients. In: Prigatano GP, Schacter DL, editors. *Awareness of Deficit after Brain Injury*. Oxford: Oxford University Press, 1991: 176–97.
- Johnson MK, Raye C. Cognitive and brain mechanisms of false memories and beliefs. In: Schacter DL, Scarry E, editors. *Memory, Brain, and Belief*. Cambridge, MA: Harvard University Press, 2000: 35–86.
- Johnson MK, Hayes SM, D'Esposito M, Raye C. Confabulation. In: Boller F, Grafman J, editors. *Handbook of Neuropsychology*, Vol 2. Memory and its Disorders. 2nd ed. Amsterdam: Elsevier Science, 2000: 383–407.
- Kopelman MD. Two types of confabulation. *Journal of Neurology, Neurosurgery and Psychiatry* 1987; 50(11): 1482–7.
- Kopelman MD, Ng N, Van den Brouke O. Confabulation extending across episodic, personal, and general semantic memory. *Cognitive Neuropsychology* 1997; 14(5): 683–712.
- Kopelman MD, Wilson B, Baddelley A. The Autobiographical Memory Interview. Suffolk: Thames Valley Test Company, 1990.
- McAdams DP. The psychology of life stories. *Review of General Psychology* 2001; 5(2): 100–22.
- McAdams DP, Reynorlids J, Lewis ML, Patten A, Bowman PT. When bad things turn good and good things turn bad: Sequences of redemption and contamination in life narrative, and their relation to psychosocial adaptation in midlife adults and in students. *Personality and Social Psychology Bulletin* 2001; 27: 472–83.
- Mercer B, Wapner W, Gardner H, Benson DF. A study of confabulation. *Archives of Neurology* 1977; 34(7): 429–33.
- Moscovitch M. Confabulation and the frontal system: Strategic versus associative retrieval in neuropsychological theories of memory. In: Roediger HL, Craik FIM, editors. *Varieties of Memory and Consciousness: Essays in the Honour of Endel Tulving*. Hillsdale, NJ: Lawrence Erlbaum Associates, 1989: 133–60.
- Moscovitch M, Melo B. Strategic retrieval and the frontal lobes: Evidence from confabulation and amnesia. *Neuropsychologia* 1997; 35(7): 1017–34.
- Neisser U. Five kinds of self-knowledge. *Philosophical Psychology* 1988; 1: 35–59.
- Nelson K. Self and social functions: Individual autobiographical memory and collective narrative. *Memory* 2003; 11(2): 125–36.
- Pillemer DB. Momentous events and the life story. *Review of General Psychology* 2001; 5: 123–34.
- Schnider A. Spontaneous confabulation and the adaptation of thought to ongoing reality. *Nature Review Neuroscience* 2003; 4: 662–71.
- Schnider A, von Däniken C, Gutbrod K. The mechanisms of spontaneous and provoked confabulations. *Brain* 1996; 119(4): 1365–75.
- Shallice T, Evans ME. The involvement of the frontal lobes in cognitive estimation. *Cortex* 1978; 14: 294–303.
- Solms M. A Psychoanalytic perspective on confabulation. *Neuro-psychoanalysis* 2000; 2: 133–43.
- Wechsler D. Wechsler Adult Intelligence Scale (WAIS-III). London: The Psychological Corporation, 1998a.
- Wechsler D. Wechsler Memory Scale (WMS-III). London: The Psychological Corporation, 1998b.
- Wechsler D. Wechsler Test of Adult Reading (WTAR). San Antonio, TX: USA: The Psychological Corporation, 2001.
- Weinstein EA. Symbolic aspects of confabulation following brain injury: Influence of premorbid personality. *Bulletin of the Menninger Clinic* 1996; 60: 331–50.
- Wilson B, Alderman N, Burgess PW, Emslie H, Evans JJ. Behavioural assessment of the Dysexecutive Syndrome. Manual. Suffolk: Thames Valley Test Company, 1996.
- Zigmont AS, Snaith RP. The Hospital Anxiety and Depression Scale (HADS). *Acta Psychiatrica Scandinavica* 1983; 67: 361–70.