Confabulation: Remembering ‘Another’ Past, Planning ‘Another’ Future

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Abstract

In this study we describe a patient, GA, who developed an amnesic-confabulatory syndrome, following a subarachnoid haemorrhage and ischaemia due to rupture of the anterior communicating artery and subsequent vasospasm. As far as the performance on memory tasks was concerned, GA’s confabulation was found to be restricted to the autobiographical aspect of episodic memory. Confabulation did not manifest itself in episodic learning tasks nor on tasks tapping various kinds of semantic knowledge. In contrast, GA confabulated in orientation in time and place tasks and also in tasks where she was required to plan her personal future. GA’s confabulation could not be accounted for in terms of an impairment of strategic retrieval or of reality monitoring processes. It is suggested that GA’s confabulation reflects a pathological awareness of personal temporality.

Introduction

Confabulation is a symptom, observable in amnesic patients who are unaware of their memory deficit. It consists of actions and verbal statements that are unintentionally incongruent to the patient’s history, background and present situation (Dalla Barba, 1993a). This rather infrequent disorder is classically described in Korsakoff’s syndrome (Bonhoeffer, 1904; Wyke and Warrington, 1960; Tal!land, 1961; Mercer et al., 1977; Cermak et al., 1980; Dalla Barba et al., 1990; Benson et al., 1996; Schneider et al., 1996), but also in patients suffering from ruptured aneurysms of the anterior communicating artery, subarachnoid haemorrhage or encephalitis (Luria, 1976; Stuss et al., 1978; Kapur and Coughlan, 1980; Alexander and Freedman, 1984; Vilkki, 1985; Moscovitch, 1989; Delbecq-Derouesne et al., 1990; Irie et al., 1992; Kopelman et al., 1995; Moscovitch, 1995; Papagno and Muggia, 1996; Schneider et al., 1996; Dalla Barba et al., 1997), head injury (Weinstein and Lyerly, 1968; Baddeley and Wilson, 1986; Dalla Barba, 1993b; Schneider et al., 1996), Binswanger’s Encephalopathy (Dalla Barba, 1993a), Alzheimer’s disease (Kern et al., 1992) and aphasia (Sandson et al., 1986).

Confabulation has traditionally been considered a disorder of memory and, in particular, a disorder of the retrieval or post-retrieval stage from long-term memory (e.g. Baddeley and Wilson, 1986; Moscovitch, 1989, 1995; Johnson, 1991; Burgess and Shallice, 1996). There is evidence, however, that considering confabulation as a disorder confined to long-term memory is probably restrictive. In fact, confabulators usually make confabulatory errors in time and space orientation tasks (e.g. Dalla Barba et al., 1990; Dalla Barba, 1993a,b). There is also some clinical evidence that confabulation can also manifest itself when the patient is required to plan his personal future. For example, Dalla Barba (1993a) reported that on one occasion the patient MB ‘said that he was looking forward to the end of the testing session because he had to go to the general store to buy some new clothes . . . On this occasion the patient actually attempted to leave his hospital room, claiming that there was a taxi waiting for him downstairs’ (p. 4). Dalla Barba’s tentative conclusion is that the subjectively experienced temporality, in its continuity and unity, is a crucial factor in MB’s confabulation.

This paper describes the study of a patient, GA, who developed an amnesic-confabulatory syndrome, following a subarachnoid haemorrhage and ischaemia due to rupture of the anterior communicating artery and subsequent vasospasm. GA’s confabulation involved the autobiographical aspect of episodic memory, as well as her performance in orientation in time and place tasks and in tasks where she was required to plan her personal future. This is the first case in which confabulation extending to...
the entire personal temporality, i.e. past, present and future, is experimentally documented.

The study of GA’s case also provides interesting information concerning the role of search and monitoring processes in confabulation. Most of the current ideas about mechanisms underlying confabulation emphasize the role of a frontal executive dysfunction in this disorder (Baddeley and Wilson, 1986; Kopelman, 1987; Moscovitch, 1989; Delbecq-Derouesne et al., 1990; Johnson, 1991; Moscovitch, 1995; Burgess and Shallice, 1996; Moscovitch and Melo, 1997). These ideas are based on the common assumption that frontal lobe neural structures are the anatomical correlate of cognitive functions that are involved in organizing and controlling the ‘cognitive material’ processed by post-rolandic brain structures. As far as memory is concerned, current theories assume that the frontal lobe represents the neural substrate involved in organizing a search in long-term memory and in evaluating the result of this search, which is the retrieved memory. According to this view, confabulation would be the result of an impairment of these search and monitoring processes based on frontal neural structures.

Moscovitch (1989, 1995; Moscovitch and Melo, 1997), for example, distinguishes between two components of retrieval. One, associative retrieval, is relatively automatic and independent of frontal functions. The other, strategic retrieval, is self-initiated, goal-directed, effortful and intelligent. Within strategic retrieval processes, two further components are hypothesized. The first involves organizing a memory search that uses whatever knowledge is available, whether semantic or episodic. Once knowledge is recovered, a second strategic process is involved in monitoring the output of the memory search and checking whether it is consistent with other information in semantic and episodic memory. According to Moscovitch (1989, 1995; Moscovitch and Melo, 1997) the disruption of the monitoring sub-component of strategic retrieval would be responsible for confabulation.

Following a similar perspective Johnson (1991) argues that confabulation is a disorder resulting from a failure of ‘reality monitoring’ (i.e. deciding whether a memory is a trace of something that actually happened to you, or is a memory of an imagined event), and suggests that reality monitoring is a function of two kinds of judgement processes. The first is based on the evaluation of the qualitative characteristics of the retrieved information (e.g. the type and amount of perceptual details); the second is based on a more deliberate evaluation of retrieved information in the light of other supporting memories and knowledge. Damage to frontal structures would result in an impairment of judgement processes involved in reality monitoring and so in confabulation.

In a study based on the analysis of healthy volunteer’s autobiographical recollections of recent everyday events, Burgess and Shallice (1996) argue that errors in recall made by normal subjects and those made by confabulators can be accounted for as the result of damage to different components of control processes. These are considered part of the Supervisory System (Norman and Shallice, 1980/1986) which is held to be a function of the frontal cortex.

These hypotheses about the origin of confabulation are challenged by several types of observations: (a) two patients have been described with a confabulatory syndrome where there were spared executive functions and no frontal pathology (Dalla Barba et al., 1990; Dalla Barba, 1993a); (b) the confabulating patient described by Delbecq-Derouesne and co-workers (1990) had a documented frontal lobe lesion but performed normally on tasks supposed to be sensitive to frontal lesion; (c) the confabulating patient recently described by Dalla Barba and co-workers (1997) showed impaired executive functions without any evidence of structural or functional damage to the frontal lobe; (d) in some patients confabulation affects the performance on episodic memory tasks but not on semantic memory tasks. Taken together, these findings suggest that a retrieval control hypothesis is insufficient in accounting for confabulation. They also cast doubts on the hypothetical prominent role of a frontal dysfunction in confabulation, and on the anatomical basis of executive tasks.

Case report

History

GA is a 52-year-old right-handed woman with 5 years of education. She is married and has two children. She has always worked as a housewife. She has no history of psychiatric or neurologic diseases.

On 29 June 1995 she was admitted to the Neurosurgery Department of the Treviso General Hospital suffering from a severe headache, with no neurological signs. A CT brain scan showed a subarachnoid haemorrhage. An arteriography showed an aneurysm of the anterior communicating artery. On 3 July she was operated on in order to clip the aneurysm. A few hours after the operation the patient fell into a coma. An Echo-Doppler study showed a severe bilateral vasospasm of the brain vessels. A CT scan performed on that occasion showed an ischaemic lesion involving the frontal lobe bilaterally. An (18F) fluorodeoxyglucose PET study in the resting state performed 1 week later showed an extensive cortico-subcortical hypometabolism involving the anterior commissure, the medial frontal cortex, the inferior part of the left frontal lobe and the periventricular white matter. An MRI performed on 31 July showed bilateral frontal degenerative areas extending from the orbito-frontal regions to the dorsal areas, involving the anterior cingulum and the anterior two-thirds of the corpus callosum. The patient remained in a coma for approximately 3 months. Nine months after the vascular accident the patient was referred to the Neurology
Department of the University of Padova for neuropsychological evaluation and was seen on various occasions between March and November 1996. The neurological examination was normal.

**Neuropsychological examination**

The patient's collaboration during the testing sessions was good. On direct questioning she was shown to be disoriented and confabulated in time and space. She performed well on certain tasks which are in general considered to be sensitive to intellectual deterioration, such as the Raven's Coloured Progressive Matrices—PM 47 where she achieved a score of 25/36 (Equivalent Score = 3), the Mini Mental State Examinations (Folstein et al., 1975) (25/30), and proverbs interpretation. On bedside tests of oral expression, understanding of oral language, reading, writing, neglect, praxis, calculation and short-term memory the patient was judged to be normal.

**Tests considered sensitive to frontal lesions**

As GA had a lesion extensively involving the frontal lobe structures, her performance was examined on tasks that are traditionally considered sensitive to frontal lobe lesions. Her performance on these tasks varied greatly. On the Modified Card Sorting Test (Nelson, 1976) she performed normally: she achieved five categories and produced only four perseverative errors (score = 36.1, cut-off for frontal lobe lesion = 50% of perseverative errors). Her performance was also normal on the Cognitive Estimates (Shallice and Evans, 1978) and on the Tower of London (Shallice, 1982; Alamanno et al., 1987) where she achieved the maximum score. On other tests, however, her performance was markedly impaired. In Luria's sequencing tests (Luria, 1966) she was unable to learn a sequence of gestures of length 2. On tasks of Verbal Fluency she was also very defective. On Category Fluency, a test that requires generating as many words as possible in 1 minute from a given semantic category (e.g. animals), she produced an average of four words, and on Letter Fluency, involving generating as many words as possible in 1 minute starting with the letters F, A and S, she produced an average of three words. The Trial Making Test (Davies, 1968) was impossible.

To summarize, GA's performance on tests traditionally considered sensitive to frontal lesions varied greatly: in seven tests of this type, her performance was completely normal on three and markedly impaired on the others.

**Clinical tests of memory**

On the Wechsler Memory Scale (see Table 1) GA's MQ was 70, which is a clearly pathological score. Individual subtest scores ranged from very defective on Visual Reproduction and Logical Memory to average on Digits and Mental Control. On the Warrington Recognition Memory Test (Warrington, 1984) she performed at the chance level both on the words (25/50) and on the faces (26/50) subtests. In another task she was presented with 50 photographs of unknown faces and then asked for a Yes–No recognition test in which the 50 target faces together with an equal number of distracters were presented and she had to select the items that she had seen before. Her performance on this test was also at the chance level since she correctly recognized 30/50 target items and made 20/50 false recognitions. A questionnaire concerning public events relevant to the Italian population for which normative data are available (Costa et al., 1989) was given to GA. The questionnaire is given in a recognition form and includes six questions per biennium, from 1965 to 1985, with four choices per question. On this test she was correct only five times out of 60, she made six false recognitions and refused to choose any of the four alternatives 49 times. She was also very defective in learning tasks. She was unable to learn a supraspan sequential length corresponding to her spatial span + 2 (De Renzi et al., 1977a) and to learn a 10-word list after 20 presentations (De Renzi et al., 1977b).

**Semantic memory**

GA's performance in tasks involving various types of semantic knowledge was normal: definition of words, pointing out the correctly coloured object, performing a symbolic gesture on spoken request, the Boston Naming Test, detecting semantic anomalies (Baddeley, 1982), were all carried out correctly.

**Examination of confabulation**

GA produced most of her confabulations in informal conversation, when answering specific questions and spontaneously, mainly referring to autobiographical episodic memory. Confabulation was always plausible and semantically appropriate so that a hypothetical observer not familiar with GA's history, background and present situation could hardly tell whether GA's reports were confabulatory or not. For example, she would claim that the day before, she went out shopping and then prepared a
meal for her family. In this case it is impossible to tell whether this is a confabulatory report unless one knows that since her illness GA had never gone shopping nor had she ever prepared any meals.

**Confabulation Battery**

To further examine GA’s confabulation, we submitted her to the Confabulation Battery (Dalla Barba, 1993a), including questions probing personal, general and linguistic semantic memory, episodic memory, orientation for space and time and questions to which the appropriate response would be ‘I don’t know’, both semantic (e.g. ‘What did Marilyn Monroe’s father do?’) and episodic (e.g. ‘Do you remember what you did on 13 March 1985?’). Table 2 shows GA’s and 12 normal control (NC) subjects’ performance on the Confabulation Battery. As it clearly emerges from Table 2, GA’s confabulations were found to be restricted mainly to episodic memory and orientation in time and place. GA’s confabulation appears to be independent of the availability of the correct answer since she never confabulates on ‘I don’t know’ questions or on Linguistic Semantic Memory questions where she was able to provide the correct answer only eight times out of 15.

**Strategic retrieval and confabulation**

Moscovitch’s (1989, 1995; Moscovitch and Melo, 1997) hypothesis of confabulation as a consequence of a deficit of strategic retrieval is meant to be applied equally across all domains of memory. In other words, confabulation should equally affect episodic and semantic memory if both episodic and semantic memory tasks require the involvement of the strategic retrieval process. This hypothesis seems to have difficulties in accounting for the present case and for two previously described cases (Dalla Barba et al., 1990; Dalla Barba, 1993a,b) in which confabulations were confined to the domain of episodic memory. However, Moscovitch (1995) argued that Dalla Barba and co-workers’ patients showed confabulation in episodic memory but not in semantic memory because the tests used to assess episodic memory made greater demands on strategic retrieval processes than those used to assess semantic memory. Accordingly, and in order to attempt to equate the strategic retrieval demands of semantic and episodic memory, Moscovitch (1995; Moscovitch and Melo, 1997) devised a semantic, historical version of the word-cue test developed by Galton (1879) and revised by Crovitz and Schiffman (1974) to complement the traditional episodic version of the test. Using this technique Moscovitch (1995; Moscovitch and Melo, 1997) found that patients with damage to the ventromedial portion of the frontal lobe confabulated on both the episodic and the semantic version of the test. We used Moscovitch’s technique in order to ascertain whether the virtual absence of confabulation in semantic memory in GA was an artefact due to the poor involvement of strategic retrieval in answering the semantic questions of the Confabulation Battery. In the episodic version of the test, GA and seven control subjects were presented with eight cue-words and asked to produce a specific detailed account of an autobiographical event related to that word. In the semantic version of the test the procedure was identical to that used in the episodic version, except that this time in response to the cue-word subjects had to describe in detail a historical event which occurred before they were born (see Appendix 1). Responses were scored on a 0–2 scale with two points for a detailed description of the event, one point for a less detailed description and zero points for a general statement or if nothing was provided. All responses were scored by two independent raters. Agreement between them was 100%. Memories for both semantic and personal cue-words were verified for confabulations, using historical sources for the semantic test and questioning close relatives for the episodic test. Table 3 shows GA’s and normal controls’ performance on this test. As seen in the table, GA scored poorly on both versions of the test when compared to normal subjects. Confabulations were present only in the episodic version of the test. In addition, confabulations in the episodic test were much less frequent (13%) as compared to confabulations observed in episodic memory (33%) and orientation in time and place questions (40%) of the Confabulation Battery. This difference may reflect the fact that the Confabulation Battery included specific questions that were probably more effective as retrieval cues than the cue-words included in the Crovitz test. As far as

<table>
<thead>
<tr>
<th>Question</th>
<th>GA Correct</th>
<th>GA Confab.</th>
<th>Normal controls Correct (SD)</th>
<th>Normal controls Confab.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Personal semantic memory</td>
<td>85</td>
<td>5</td>
<td>100 (0)</td>
<td>0</td>
</tr>
<tr>
<td>Episodic memory</td>
<td>46</td>
<td>33</td>
<td>93 (6)</td>
<td>0</td>
</tr>
<tr>
<td>Orientation time place</td>
<td>60</td>
<td>40</td>
<td>100 (0)</td>
<td>0</td>
</tr>
<tr>
<td>General semantic memory</td>
<td>73</td>
<td>6</td>
<td>93 (7)</td>
<td>0</td>
</tr>
<tr>
<td>Linguistic semantic memory</td>
<td>53</td>
<td>0</td>
<td>90 (8)</td>
<td>0</td>
</tr>
<tr>
<td>‘I don’t know’ episodic</td>
<td>0</td>
<td>0</td>
<td>0 (0)</td>
<td>0</td>
</tr>
<tr>
<td>‘I don’t know’ semantic</td>
<td>0</td>
<td>0</td>
<td>0 (0)</td>
<td>0</td>
</tr>
</tbody>
</table>
the low baseline level of confabulation in the episodic memory version of the Crovitz test is concerned, this may have prevented finding confabulation in the semantic version of the same task. Yet, however low the rate of confabulation in the episodic version of the test, the results of this test were dissociated from the results of the semantic version of the same task where confabulation was never observed. Therefore, the present results, i.e. the greater amount of confabulation in the Confabulation Battery where strategic retrieval is likely to be less involved than in the Crovitz test and the absence of confabulation in the semantic version of the Crovitz test, cast serious doubts on a strategic retrieval deficit hypothesis as the cause of confabulation.

**Source monitoring and confabulation**

It has been argued (Johnson, 1991) that confabulation might be the result of the disruption of mechanisms involved in monitoring the origin of information so that imagined events are mistaken for really experienced events. In order to test this hypothesis we administered a yes/no recognition memory task to GA followed by a source monitoring task. The first task was devised in order to have a baseline control for the experimental material. In the study phase 16 coloured drawings of common objects were presented to GA and 10 control subjects, one after the other, for approximately 3 seconds each. Immediately following the presentation of the 16 items, the subjects were presented with a list of 32 printed words, where half of the words were names of the objects seen in the study phase and the other half were distracters, i.e. names of common objects not presented in the study phase. Subjects had to indicate the words corresponding to the objects seen in the study phase. In the study phase of the second task, following the same procedure as the previous one, the subjects were first presented with a new set of 16 coloured drawings of common objects. They were then read a list of 16 names of common objects and for each name they were asked to imagine the corresponding object. Immediately afterwards they were presented with a list of 32 printed words, where half of the words were names of the objects seen and the other half were names of the objects they had to imagine. For each word, subjects were asked to say whether that word was the name of an object they had seen or imagined in the study phase. Table 4 shows the results of these recognition memory and source monitoring tasks. On the recognition memory task GA’s performance was at the level of chance. However, her poor performance on this task cannot be attributed to a tendency to recognize as already seen any presented item, since the rate of false recognition was 31%. On the source monitoring task GA’s performance was also very impaired, but there was no evidence of a tendency to attribute imagined events to direct perception or vice versa. In fact, regardless of whether the response was correct or not, GA gave 50% of ‘seen’ responses and 50% of ‘imagined’ responses. Although these results show that GA is suffering from a source monitoring deficit, GA’s confabulation cannot be attributed to the incorrect acceptance of any item as a memory or to the tendency systematically to consider imagined events as really experienced events.

It might be suspected, however, that the low rate of false recognition, in the recognition memory task, and the lack of the tendency to attribute to visual perception what was imagined, in the monitoring task, are due to an effect of the experimental material. In fact, the items that were used, drawings and names of common objects, are ‘neutral events’, in the sense that they are irrelevant to GA’s daily life and biography. It could be the case that GA shows a tendency to recognize as true memories only events, experienced or imagined, that concern her daily life and
biography. If this is the case, GA should recognize as memories both really experienced episodes as well as her confabulations. In order to check this possibility we administered a yes/no recognition memory task to GA in which she was presented orally with sentences referring either to true episodes from her recent past, collected from her husband, or to confabulations she had produced in previous testing sessions. Sentences representing true episodes, e.g. ‘today for lunch you had boiled meat’, and sentences representing confabulatory episodes, e.g. ‘today for lunch you cooked spaghetti’, were selected and presented to her in a random order. Table 5 gives the results of this task. GA recognized as true memories 86% of her confabulations, whereas she recognized as true memories only 43% of episodes she had really experienced. From these results it clearly emerges that GA does not show the tendency to accept as true any candidate autobiographical memory because of a deficit of monitoring processes. She actually seems to adhere much more to her confabulatory past than to her real past. GA’s tendency to recognize her confabulation, rather than episodes she had really experienced, as true may be explained as follows: GA’s confabulation reflects a tendency to consider her general habits or personal semantic information, which are presumably more strongly represented in long-term memory, as true autobiographical episodes. This will be discussed more extensively later.

### Confabulation and temporality

According to the observation that confabulators often confabulate in orientation in time and place tasks as well as when they are questioned about their personal future, it has been proposed (Dalla Barba, 1993a) that confabulation is not only a disturbance of memory but also involves all subjectively experienced temporality extending to the personal present and to the personal future. In order to test this hypothesis we administered two further tasks to GA and seven control subjects. In the first task we selected 10 episodic memory questions concerning her personal past and 10 questions concerning her personal future (see Appendix 2). Episodic memory questions and questions concerning the future were matched for proximity to the moment when the questions were asked. Answers were scored as ‘correct’, ‘wrong’ or ‘confabulation’, according to whether they were consistent with information (collected from her husband) concerning the patient’s past, present situation and probable future activities. It might be argued that as far as questions about the personal future are concerned, any possible answer is a confabulation, since by definition the future is only ‘probable’ and there is in principle no ‘correct’ answer to questions about the future. Yet, answers concerning the personal future can be definitely confabulatory when they show a marked discrepancy or a real contradiction with what a predicted future action might be, in view of the present situation. For example, to the question ‘What are you going to do in a few minutes?’, GA answered ‘I will go home to cook the supper’. Since her disease, she actually never cooked and she was living one and a half hours from the hospital. To the question ‘What are you going to do tomorrow?’ she replied ‘I will go out shopping alone by car’. She never did that since her disease and she would certainly not do it the following day. As shown in Table 6, GA’s confabulations extended equally to questions concerning episodic memory and her personal future.

The second task was a ‘future’ version of the Crovitz test. In this task the same eight cue-words used in the classic episode version of the test were given to GA and to control subjects. For each word, subjects were asked to produce a specific, detailed account of a personal project related to that word. Subjects responses were scored on a 0-2 points scale following the procedure employed for the episodic and semantic versions of the test. Confabulations were detected according to the same criteria used in the previous task. The results of this task are presented on Table 7 together with the results of the episodic and semantic versions of the test for comparison. The results clearly show that GA also confabulated when in response to a cue-word she had to provide a personal project and indeed even more than when she was asked to provide an autobiographical past event. GA’s performance on these tasks, together with her confabulations on orientation in time and space tasks, provides evidence in support of the hypothesis that confabulation involves all the subjectively experienced temporality in its continuity and unity.

### Discussion

The patient we have described suffers from a relatively pure amnesic syndrome, in the sense that the memory impairment is not associated with any other cognitive impairment likely to interfere with memory performance. GA performs well on tests of intellectual efficiency such as Progressive
Table 7. GA's and normal controls' performance on the Crovitz test

<table>
<thead>
<tr>
<th></th>
<th>GA Mean score (SD)</th>
<th>% of confabulation</th>
<th>Normal controls Mean score (SD)</th>
<th>% of confabulation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Episodic</td>
<td>0.9</td>
<td>13</td>
<td>1.9 (0.2)</td>
<td>0</td>
</tr>
<tr>
<td>Semantic</td>
<td>0.6</td>
<td>0</td>
<td>1.8 (0.2)</td>
<td>0</td>
</tr>
<tr>
<td>Future</td>
<td>0.5</td>
<td>50</td>
<td>1.6 (0.3)</td>
<td>0</td>
</tr>
</tbody>
</table>

Matrices and the MMSE as well as on tests of short-term memory. She has an extensive lesion involving the frontal lobe from the orbital to the dorsal areas, yet her performance on tests considered sensitive to frontal lobe lesions varied greatly, ranging from normal on the Nelson's version of the Wisconsin Card Sorting Test, the Cognitive Estimates and the Tower of London, to massively impaired on Verbal Fluency, Luria's sequencing tests and the Trail Making Test. Her amnesia involves memory for both personal and public episodes, as well as learning of new information as reflected by her poor performance on the Wechsler Memory Scale and on tests requiring the retrieval or recognition of personal or impersonal episodes. In contrast, although her performance on tasks tapping various types of general knowledge is poor, but not dramatically impaired, her confabulatory syndrome does not extend to tasks involving the retrieval of information from general knowledge. In addition, she never confabulates when she is required to answer questions, semantic and episodic, to which the appropriate response would be 'I don't know'. Taken together these findings suggest that GA's confabulation does not reflect a tendency to fill a gap in memory (Barbiet, 1963; Talland, 1965; Sandson et al., 1986; Kopelman, 1987) in order to avoid embarrassment, since it appears to be totally independent of the availability of the correct answer. In other words, GA does not confabulate in response to those questions to which she does not have an answer.

**Strategic retrieval and confabulation**

One of the aims of this study was to assess the validity of Moscovitch's hypothesis (1989, 1995; Moscovitch and Melo, 1997) of confabulation as the result of an impairment of strategic retrieval. According to Moscovitch, confabulation should manifest itself equally in episodic and semantic memory if episodic and semantic memory tasks require the involvement of strategic retrieval. Moscovitch (1995) argued that a 'reason for the greater prevalence of confabulation about episodic memory is that retrieval of episodic memories in the laboratory and in real life are likely to make greater demands on strategic processes than retrieval of semantic memories' (p. 16). In support of the idea that confabulation is the result of a strategic retrieval deficit, Moscovitch (1995) Moscovitch and Melo (1997) provides evidence of patients who confabulate both in the episodic and the semantic version of the Crovitz test. In the present study we were not able to replicate Moscovitch's results. In fact, the study of GA's case shows that she does not confabulate on semantic memory tasks even when a considerable amount of strategic retrieval is required, as in the semantic version of the Crovitz test. Further evidence against a strategic retrieval deficit account of confabulation comes from GA's performance on the Cognitive Estimates test. This test requires that the subject answer questions which do not have a readily available correct answer (e.g. 'How many camels are there in Holland?'), and the subject in order to provide a plausible answer, is constrained to make a judgement involving the activation, co-ordination and control of several kinds of semantic information. Thus, strategic retrieval is expected to be prominently involved in the production of a plausible answer on this test. However, GA not only does not confabulate on this test, but her performance is perfectly normal. So, according to the present results, a strategic retrieval deficit hypothesis as the origin of confabulation is not confirmed. Consequently we argue that confabulation confined to episodic memory, as in GA's case and, possibly, in other studies (Dalla Barba et al., 1990; Delbecq-Derouesne et al., 1990; Dalla Barba, 1993a,b; Dalla Barba et al., 1997) is an empirically proved phenomenon and not the result of an experimental artefact due to poor involvement of strategic retrieval.

**Confabulation and monitoring processes**

A second issue we wanted to address in this study concerns the relationship between confabulation and processes involved in monitoring the origin of information. Johnson (1991) argues that confabulation reflects a disruption of processes involved in 'reality monitoring' (i.e. deciding whether a memory represents something that actually happened to you, or is a memory of an imagined event). A disruption of this type of process would result in mistaking imagined events for really experienced events, thus determining confabulation. This kind of perspective, however, does not account for the fact that confabulation, as in the present case and other studies (Dalla Barba et al., 1990; Delbecq-Derouesne et al., 1990; Dalla Barba, 1993a,b; Dalla Barba et al., 1997), can be confined to the autobiographical aspect of episodic memory while it is absent in episodic learning tasks and in tasks that require retrieval of non-episodic information. In fact, if a disruption of reality
monitoring were responsible for confabulation. Confusion between really experienced and imagined events and information should not be limited to autobiographical episodic retrieval but should extend across all memory domains. Further doubts on the relationship between a deficit of reality monitoring and confabulation are cast by GA’s performance on recognition and source monitoring tasks. GA shows source amnesia as reflected by her performance at chance on the source monitoring task. However, she does not systematically attribute to visual perception what was imagined or vice versa. In addition, on recognition memory tasks she does not show a tendency to recognize as already seen any item she is presented with, as reflected by the low rate of false recognition on the recognition memory task. Therefore, although GA shows a source monitoring deficit, it seems restrictive to trace back GA’s confabulation to a general deficit of processes involved in reality monitoring, or to a systematic bias to recognize as part of her past experience any present information. One possibility, as suggested elsewhere (Dalla Barba, 1993a), is that distinct reality monitoring processes are specific to different types of retrieval, so that confabulation confined to episodic memory would reflect the disruption of reality monitoring processes operating in episodic memory retrieval, while reality monitoring processes operating in other types of retrieval are intact. This type of account, however, is compromised by GA’s performance on the task in which she was asked to recognize sentences referring to true episodes from her recent past or to confabulation she had produced in previous testing sessions. The results of this task show that GA recognizes her confabulations as true memories, whereas she is at the level of chance in recognizing really experienced episodes. If a deficit of processes involved in reality monitoring were present in GA and responsible for her confabulation, one would expect the same pattern of yes/no responses both for sentences referring to confabulations and for those referring to true memories.

**Confabulation and temporality**

The most interesting aspect of GA’s case study is that her confabulation does not only involve the retrieval of personal past episodes and present orientation in time and place, which is a known characteristic of some confabulators, but manifests itself also when she is asked to plan her personal future. The extension of GA’s confabulation to all the three dimensions of temporality—past, present and future—seems to be something more than a fortuitous coincidence. GA confabulates when she has to answer questions like ‘What did you do yesterday? Where are you now? What are you going to do tomorrow?’ but she never confabulates answering questions concerning historical events or in traditional laboratory learning tasks. In this sort of task her poor performance is in fact due to errors of omission and not to intrusions or even fleeting confabulation. Also, she is very good on the Tower of London, which is a planning task. What all these tasks have in common, and at variance with tasks where GA confabulates, is that they do not involve subjective temporality, in the sense that they do not require the involvement of the personal history, present situation and probable future of the subject who is performing them. In contrast, GA confabulates when subjective temporality is involved, i.e. when she has to address her personal past, present and future. Recently, Conway and Tzachi (Conway and Tzachi, 1996) described a patient, OP, who confabulated in autobiographical memory. They interpret OP’s confabulation within the framework of Conway’s theory of autobiographical memory (Conway, 1992; Conway, 1996; Conway and Rubin, 1993), suggesting that their patient’s confabulation is the result of a disruption of the self due to the damage of frontally based control processes of memory (Burgess and Shallice, 1996; Johnson, 1991). In their view OP’s confabulation is motivated by the purpose of protecting the self in a time of stress and isolation. The problem with this interpretation is that none of the elements invoked to explain confabulation is conscious: the self, control processes and the purpose to protect the self are all unconscious. We have shown elsewhere (Dalla Barba, 1993; Dalla Barba, 1997) that considering control processes of memory as operating outside consciousness poses major theoretical problems as this would necessitate the attribution of intentionality to the unconscious. The same argument applies to the hypothesis of an unconscious self and of an unconscious purpose to protect this self. To attribute intentionality to an unconscious process means to provide it with the property of being subject, that is, to attribute consciousness to the unconscious. Like in a game of Chinese boxes, the subject would contain another subject, an homunculus, provided with a shady and inaccessible consciousness, that is busy solving problems such as rejecting false memories and providing conscious consciousness with the result of its accurate selection. According to these criteria, can the homunculus distinguish between true and false information? Does not the homunculus also need an unconscious homunculus that helps it to distinguish between true and false memories? Like this the Chinese boxes game continues endlessly, and what we are left with is just a *reductio ad infinitum*.

When GA confabulates, she acts like somebody who is aware of her past, present and future. The problem, however, is that she is aware of a past, a present, and a future that are ‘false’, in the sense that they do not represent a past, present and future coherent with her actual situation. It has been suggested that confabulation reflects a disturbance of chronology or of time-order memory, so that real memories are confused in temporal context (Korsakoff, 1889; Schneider et al., 1996; Talland, 1961; Van der Horst, 1956; Victor et al., 1971). This interpretation, however, is challenged by the fact that many amnesic and non-amnesic patients have disordered
Assumption 1
Events produce atemporal and aspecific modifications in the Long-Term Storage System (LTSS). These modifications, represented in Fig. 1 as X, Y, and Z, are atemporal in the sense that they do not contain any information concerning time. They do not represent the past, the present or the future, nor are they organized according to the order of succession, i.e. there is nothing in Y, for example, that tells that Y comes before Z and after X. They are aspecific in the sense that they do not contain any information specifying that they are representing episodes, meanings, rules, procedures, algorithms, etc.

Assumption 2
The modifications in the LTSS can be more or less stable and more or less vulnerable depending on a number of variables. These variables act at the encoding and storage level and include, among others, attention at encoding, emotional value of encoded and stored event, depth of encoding, rehearsal and repeated experience of the same event or similar events.

Assumption 3
Consciousness means to be conscious of something in a specific way. That means that consciousness is not an aspecific dimension that passively receives and becomes aware of different types of already specified information, but rather that different types of consciousness exist, each representing an original and irreducible way of addressing the world. Different types of consciousness include, among others, temporal consciousness (TC) and knowing consciousness (KC). TC means to become aware of something as part of a personal past, present or future. KC means to become aware of something as a meaning or as an element of impersonal knowledge or information.

Assumption 4
TC can, and usually does, interact with the less stable and more vulnerable modifications of the LTSS in order to remember the past, be oriented in the present and plan the future.

According to this model, confabulation in episodic memory (e.g. Dalla Barba, 1993a; Dalla Barba et al., 1990), in orientation in time and place and in personal future planning tasks, as in GA’s case, is the result of a condition in which TC is still intact but cannot use less stable modifications of the LTSS but only more stable ones, in order to remember the personal past, be oriented in the present and plan personal future. In other terms, this is a condition in which TC is still intact but is no longer able to accomplish its usual task, i.e. to operate a sort of fine grain search in the LTSS and use less stable modifications in order to set up a personal temporal workspace. What TC does instead in this condition is to use more stable modifications of the LTSS, with the result that habits or personal semantic information are considered in a personal temporal framework. When asked what they have done the previous day or what they are going to do the following day, confabulating patients of this type typically answer with memories and plans that they usually have in their daily life. Although admitted to the hospital, they will say,
for example, that the previous day they went out shopping and that the following day they will be visiting some friends, acts that presumably were part of their routine life.

It could be argued that patients who confabulate in episodic memory, orientation and planning tasks are not necessarily conscious of a confabulatory past, present and future but rather they simply produce the more plausible answer without having a subjective experience of remembering, of being in that place at that time or of planning their actions. If this were the case our account of confabulation in the past, present and future would be dismissed because TC would not play any role at all in confabulation.

Yet there is evidence that patients who confabulate actually do become aware of their confabulatory past, present and future. For example [Dalla Barba (1993a) following the procedure described by Tulving (1985)], the patient MB was asked to attribute a 'remember' or a 'know' judgement to his confabulation in episodic memory task; he systematically gave 'remember' judgements. Also, the same patient showed he was ready to carry out his confabulatory plans (see also Baddeley and Wilson, 1986; Moscovitch, 1989). In addition, from a clinical point of view, confabulating patients do not look like subjects who produce their 'best guess' in answering questions, but rather they seem to adhere completely to their confabulatory reports. Therefore, although more experimental evidence is suitable, it does not seem to be misleading to consider confabulation in episodic memory, orientation and future planning tasks as a condition in which TC can interact only with more stable modifications of the LTSS.

It is well known that patients sometimes also confabulate in some semantic memory tasks (e.g. Moscovitch, 1995; Moscovitch and Melo, 1997). According to our hypothesis, confabulation in semantic memory reflects a condition in which KC is still there but is unable to use more stable modifications of the LTSS. When this condition occurs patients confabulate in tasks tapping general semantic knowledge, such as knowledge of public and historical facts and knowledge of famous people (e.g. Moscovitch, 1995; Moscovitch and Melo, 1997), but they do not confabulate in semantic tasks that require the use of more stable modifications of the LTSS, such as word definition tasks. Some patients, however, also confabulate in word definition tasks (Dalla Barba, 1993b). They also usually produce confabulation in episodic memory tasks that are described as fantastic (Berlyne, 1972), implausible (Baddeley and Wilson, 1986), incoherent (Kopelman, 1987) or semantically anomalous (Dalla Barba, 1993a). Confabulation in word definition tasks and fantastic confabulation in episodic memory tasks reflect a condition in which the modifications in the LTSS are degraded so that the material used by TC and KC is per se incoherent. The result is that the semantic content of confabulation in episodic memory is anomalous so that confabulation takes a fantastic and bizarre form and so does confabulation in word definition and other semantic tasks.

Acknowledgements
This article is a modified version of part of an invited paper presented at the XV European Workshop on Cognitive Neuropsychology, Bressanone, Italy, January 1997, and at the Cognitive Neuroscience and Memory Conference, Stockholm, June 1997. We are grateful to many people in the audience at those conferences and to Martin Conway and an anonymous reviewer for helpful comments on an earlier draft. This work was partially supported by the Institut National de la Santé et de la Recherche Médicale.

References
Confabulation and temporality

Received on 13 June, 1997; resubmitted on 20 August, 1997; accepted on 3 September, 1997.

Appendix 1: The list of words used to cue episodic (autobiographical) and semantic (historical) memories in the Crovitz test

<table>
<thead>
<tr>
<th>Episodic/&quot;Future&quot;</th>
<th>Semantic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Train</td>
<td>Assassination</td>
</tr>
<tr>
<td>Mountain</td>
<td>Attack</td>
</tr>
<tr>
<td>Letter</td>
<td>Discovery</td>
</tr>
<tr>
<td>Money</td>
<td>Train</td>
</tr>
<tr>
<td>Cinema</td>
<td>War</td>
</tr>
<tr>
<td>Restaurant</td>
<td>President</td>
</tr>
<tr>
<td>Hospital</td>
<td>Revolution</td>
</tr>
<tr>
<td>Market</td>
<td>King</td>
</tr>
</tbody>
</table>

Appendix 2: Questions concerning personal past and future (bold type shows questions that elicited confabulation)

**Past**

1. What did you do a few minutes ago?
2. Who did you see this morning?
3. What did you eat for dinner yesterday?
4. What did you do yesterday?
5. What did you do the day before yesterday?
6. How did you spend last Christmas?
7. Do you remember the last time you went to see a doctor?
8. Do you remember the last time you went to visit a friend or a relative?
9. Do you remember the last time you went to a restaurant?
10. Do you remember the last time you took vacation?

**Future**

1. What are you going to do in a few minutes?
2. Who are you going to see this evening?
3. What are you going to eat this evening?
4. What are you going to do tomorrow?
5. What are you going to do the day after tomorrow?
6. How will you spend next Christmas?
7. When will be the next time you visit a doctor?
8. When will be the next time you visit a friend?
9. When will be the next time you go to a restaurant?
10. When will be the next time you go on vacation?
Confabulation: Remembering ‘another’ past, planning ‘another’ future

G. Dalla Barba, J. Y. Cappelletti, M. Signorini and G. Denes

Abstract
In this study we describe a patient, GA, who developed an amnesic-confabulatory syndrome, following a subarachnoid haemorrhage due to rupture of the anterior communicating artery. As far as the performance on memory tasks was concerned, GA’s confabulation was found to be restricted to the autobiographical aspect of episodic memory. Confabulation did not manifest itself in episodic learning tasks nor on tasks tapping various kinds of semantic knowledge. In contrast, GA confabulated in orientation in time and place tasks and also in tasks where she was required to plan her personal future. GA’s confabulation could not be accounted for in terms of an impairment of strategic retrieval or of reality monitoring processes. It is suggested that GA’s confabulation reflects a pathological awareness of personal temporality.

Journal

Neurocase Reference Number:
O93

Primary diagnosis of interest
Subarachnoid haemorrhage. Frontal stroke.

Author’s designation of case
GA

Key theoretical issues
- Confabulation reflects a pathological awareness of personal temporality

Key words: confabulation; amnesia; consciousness; temporality

Scan, EEG and related measures
CT, MRI, PET

Standardized assessment
PM-47, Wechsler Memory Scale, Mini-Mental State Examination, Modified Card Sorting Test, Cognitive Estimates, Tower of London, Luria’s Sequencing Tests, Letter Fluency, Category Fluency, Trail Making Test, Digit Span, Corsi Test, Warrington Recognition Memory Test, Public Events Questionnaire, 10-word List Learning, Boston Naming Test, Semantic Anomalies Detection, Confabulation Battery

Other assessment
Crovitz Test (modified), Personal Past/Future Interview, Source Monitoring Test

Lesion location
- Bilateral frontal degenerative areas extending from the orbito-frontal regions to the dorsal areas, involving the anterior cingulum and the anterior two-thirds of the corpus callosum

Lesion type
Vascular

Language
English