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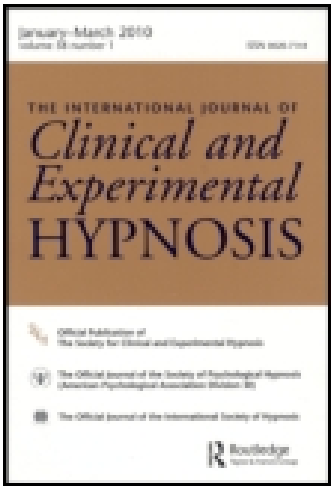

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A Hypnotic Analogue of Clinical Confabulation

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A HYPNOTIC ANALOGUE OF CLINICAL CONFABULATION

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Abstract: Confabulation—fabricated or distorted memories about oneself—occurs in many disorders, but there is no reliable technique for investigating it in the laboratory. The authors used hypnosis to model clinical confabulation by giving subjects a suggestion for either (a) amnesia for everything that had happened since they started university, (b) amnesia for university plus an instruction to fill in memory gaps, or (c) confusion about the temporal order of university events. They then indexed different types of memory on a confabulation battery. The amnesia suggestion produced the most confabulation, especially for personal semantic information. Notably, subjects confabulated by making temporal confusions. The authors discuss the theoretical implications of this first attempt to model clinical confabulation and the potential utility of such analogues.

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Clinical confabulation involves the "production of fabricated, distorted, or misinterpreted memories about oneself or the world, without the conscious intention to deceive" (Fotopoulou, Conway, Griffiths, Birchall, & Tyrer, 2007, p. 6). To illustrate the lack of insight that confabulators have about their memory deficits, Moscovitch (1989) coined the term *honest lying* to describe this pathological form of memory. Confabulation, which typically occurs in the context of amnesia, is seen across a range of neuropsychological and psychiatric conditions—including schizophrenia, Korsakoff's syndrome, dementia—and following traumatic brain injury (see Metcalf, Langdon, & Coltheart, 2007, for a summary). However, experimental investigation of clinical confabulation has proven difficult, because patients often have other symptoms and cognitive impairments. In this article, we suggest that hypnosis may offer an innovative technique for re-creating clinical confabulation in the laboratory. This use of hypnosis has been described as a way of creating "virtual patients" (Cox & Barnier,

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2013; Oakley & Halligan, 2009; see also Woody & Szechtman, 2011) as it allows us to temporarily model clinical phenomena in otherwise healthy individuals.

Confabulation typically occurs in the context of amnesia (e.g., following traumatic brain injury; Kopelman, 2010), but its content can vary. For instance, confabulation may involve bizarre descriptions of clearly false events, such as patient GN who reported that he went to a party and met a woman with the head of a bee (Turner, Cipolotti, & Shallice, 2010). However, the term also has been used to describe milder memory errors, distortions, and embellishments (see Gilboa & Verfaellie, 2010, for a summary). For example, consider the case of patient AP (reported by Metcalf, 2005), a 51-year-old male who began to confabulate after sustaining a brain injury due to severe lack of oxygen. The following transcript illustrates the nature of AP's confabulation:

Examiner: Tell me about what you would do on a typical Tuesday before you came to this hospital.
AP: Usual Tuesday would be a school day.
Examiner: A school day?
AP: Yeah, I go to school.
Examiner: And what would you do at school?
AP: Just whatever subjects I've got today. Maths, science, English. (Metcalf, 2005, p.96)

These confabulations are strikingly different to GN's. The content is nonbizarre (even if it is bizarre that a 51-year-old man claims to be going to school), and they seem to reflect confusion about time and place. Given these quite different manifestations of confabulation, there is ongoing debate about how confabulation should be classified. Distinctions have been made between momentary confabulation (true events occasionally misplaced in time and context) and fantastic confabulation (bizarre, long-standing fabrications; Berlyne, 1972) and between spontaneous confabulation (which occurs without prompting, is often acted upon and is seen in cases of amnesia and frontal lobe pathology) and provoked confabulation (seen as a normal attempt at filling in memory gaps; Kopelman, 1987). But these distinctions cannot classify all types of confabulators, and many researchers prefer to view confabulation as a continuum ranging from mild-to-severe memory distortions (Dalla Barba, 1993b). Further complexity exists when we consider the overlap between confabulation and delusion. Both are pathological forms of false belief and memory that are resistant to rational counterargument. Whereas some researchers argue that confabulation is a form of delusion (Berrios, 2000), others argue that confabulations and delusions are distinct pathologies (e.g., memory-related vs. belief-related), demanding different explanations and treatments (Kopelman, 2010; see also Langdon & Turner, 2010).

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Accounts of Confabulation

There are multiple views of confabulation, especially surrounding its definition and subtypes. Many of these views explain confabulation in terms of memory production (i.e., what causes the confabulation to arise in the first place; Moscovitch & Melo, 1997) and memory evaluation/monitoring (i.e., what processes are responsible for the maintenance and acceptance of the confabulation; Johnson, Hashtroudi, & Lindsay, 1993; Metcalf et al., 2007). We briefly outline four of these views.

According to the first broad view, confabulation involves disruptions in strategic retrieval of experienced events (Kopelman, 1999; Moscovitch, 1989; Moscovitch & Melo, 1997). Strategic memory processes operate to initiate, to guide, and to constrain a memory search (e.g., elaborating upon a retrieval cue or checking that the memory obtained is plausible). Confabulation occurs when these strategic processes are disrupted. This might result, for example, in a failure to search for an appropriate memory (influencing memory production) or a failure to successfully evaluate memories that are accessed (influencing memory monitoring). According to this view, confabulators should display both semantic (generic, context-free factual knowledge) and episodic (personally experienced events) confabulation, because disrupted strategic memory processes should influence both types of memory (Metcalf et al., 2007). However, there are cases of purely episodic confabulation that cannot be sufficiently explained by strategic deficit accounts (Dalla Barba, 1993a; Dalla Barba, Cipolotti, & Denes, 1990; Metcalf et al., 2007).

According to the second broad view, confabulation involves temporal confusion where experienced events are misplaced in time and/or context (Dalla Barba, 1993a, 1999; Dalla Barba, Cappelletti, Signorini, & Denes, 1997; Schnider, 2008; Schnider & Ptak, 1999). Confabulation occurs when previously experienced events intrude into the present (influencing memory production). This may arise due to problems filtering out irrelevant information from ongoing reality. However, some researchers (e.g., Moscovitch, 1995) argue that temporal confusion is just one symptom of confabulation and cannot account for more bizarre confabulation (e.g., patient GN who reported meeting a woman with the head of a bee; Turner et al., 2010). Others argue that temporal confusion lacks a disrupted memory evaluation/monitoring component, which is critical to fully explain confabulation (Gilboa & Moscovitch, 2002; Metcalf et al., 2007).

According to the third broad view, confabulation involves poor reality and source monitoring (Johnson et al., 1993; Johnson & Raye, 1998; Turner et al., 2010). Confabulators not only have difficulty

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determining the temporal relevance of memories but also have difficulty distinguishing between real memories and information from other sources (e.g., imaginings, thoughts, or dreams). Consequently, events that have never been experienced may be misattributed as real since evaluation deficits result in the uncritical acceptance of information as veridical (Johnson, O'Connor, & Cantor, 1997). Source-monitoring views can account for confabulation with bizarre content, since these confabulations may have their origins in imagination. However, Dalla Barba (1993b) argued against this view, stating that if confabulators had a source-monitoring deficit, they should make source errors on both episodic and semantic memory tasks (i.e., any task that requires a judgment about the source of a memory). Yet, as noted above, there are cases of purely episodic confabulation. Further, there is evidence that confabulators and nonconfabulating amnesics often perform similarly on source-monitoring tasks (Metcalf et al., 2007).

Finally, a fourth view combines elements of the strategic deficit account and elements of the source-monitoring account (Metcalf et al., 2007; Turner & Coltheart, 2010). According to this view, there are two factors that combine to produce confabulation (based on Langdon and Coltheart's two-factor theory of delusions; Langdon & Coltheart, 2000; see also Coltheart, 2007). The first factor, which explains the production of the confabulation, is the impaired retrieval of information from the autobiographical knowledge base. Retrieval is impaired because patients have difficulty using source and contextual information to bind memory fragments into coherent memories. In addition to this Factor 1 impairment, the specific content of confabulation can be influenced by motivation, personal biases, identity, and the goals of the self (see also Conway & Pleydell-Pearce, 2000; Conway & Tacchi, 1996; Fotopoulou, 2010; Metcalf, Langdon, & Coltheart, 2010). The second factor, which explains why the confabulation is not rejected as untrue, is impaired evaluation of this information. This involves impairment to thought/memory-checking processes. Turner and Coltheart (2010) suggested that in normal memory retrieval, there is an unconscious process, whereby memories that require extra conscious checking are tagged and associated with a feeling of doubt. They suggested that in confabulating patients this unconscious checking system fails. Consequently, thoughts and memories are never doubted and are thus never checked by the conscious checking system.

In summary, there is ongoing debate around definitions, classification, and theories of confabulation. This may be due in part to the variety of clinical conditions that feature confabulation. Although amnesia is common in confabulation, some patients have neurological deficits (e.g., due to traumatic brain injury) whereas others have psychiatric disorders (e.g., schizophrenia). Also, many patients have a variety of neuropsychological impairments that may interfere with

their performance on information processing and memory-related tasks designed to examine confabulation. A further challenge is that there are no viable experimental methods for investigating clinical confabulation in the laboratory that can control for this variety of clinical conditions and impairments. However, in this study, we aimed to develop a new technique to experimentally investigate clinical confabulation using hypnosis.

Note that the type of clinical confabulation we aimed to model is distinct from the large body of literature on hypnotic confabulation, which is forensically driven (e.g., Laurence & Perry, 1983, 1988; Lynn & McConkey, 1998; McConkey, 1992; McConkey, Barnier, & Sheehan, 1998; Spanos & McLean, 1986). This existing literature on hypnotic confabulation typically does not involve an explicit suggestion for amnesia (which is a core component of clinical confabulation) but instead investigates the impact of leading questions and implanting pseudomemories, sometimes in the absence of complete memory (for a review, see McConkey et al., 1998).

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Using Hypnosis to Study Clinical Confabulation

Creating hypnotic analogues of clinical conditions allows researchers to temporarily disrupt memory and information processing. Specific hypnotic suggestions can target aspects of information processing that may be involved in confabulation, and the hypnotic context can disrupt the normal evaluation of this information (Cox & Barnier, 2010, 2013; Kihlstrom & Hoyt, 1988; Oakley & Halligan, 2009; Woody & Szechtman, 2011). Thus, hypnosis may offer a way to model clinical confabulation in the laboratory.

There is an extensive literature from the last 30 years on the "instrumental" use of hypnosis to model a range of psychopathologies including delusions (e.g., Attewell, Cox, Barnier, & Langdon, 2012; Barnier et al., 2008; Cox & Barnier, 2009a, 2009b, 2010, 2013; Freeman, Cox, & Barnier, 2013; Rahmanovic, Barnier, Cox, Langdon, & Coltheart, 2012) and disorders of memory such as functional amnesia (e.g., Barnier, 2002; Cox & Barnier, 2003), and déjà vu (e.g., O'Connor, Barnier, & Cox, 2008). There is substantial evidence that hypnosis can closely map the features of these clinical conditions. For instance, in research that used hypnosis to model mirrored-self misidentification delusion (the belief that I see a stranger, not me, when I look in the mirror), we attempted to produce the delusional belief by suggesting that subjects would see a stranger when they looked in the mirror (Barnier et al., 2008; see also Barnier, Cox, Connors, Langdon, & Coltheart, 2011; Bortolotti, Cox, & Barnier, 2012; Connors, Barnier, Coltheart, Cox, & Langdon, 2012;

Connors, Cox, Barnier, Langdon, & Coltheart, 2012). High hypnotizable subjects reported seeing a stranger in the mirror with physical characteristics different to their own. They often claimed that the "stranger" was copying their actions, and some even looked around the room to find the stranger.

We also have used hypnosis to model erotomania (Attewell et al., 2012), which is the delusional belief that one is loved from afar by another person (the target). Following a hypnotic erotomania suggestion, we read subjects a story involving themselves and the target and later asked them to recall the story as well as respond to challenges to the delusion. High hypnotizable subjects confabulated in their story recall, describing specific, detailed interactions between themselves and the target. Later, they used these confabulations to support and maintain their delusion when challenged. This and other research shows that hypnotic suggestions can create compelling—but temporary—disruptions in basic cognitive processes (e.g., perception, action, memory) similar to those argued to be involved in clinical confabulation.

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The Current Study

We felt confident that hypnosis could model clinical confabulation, because hypnotic suggestions can produce amnesia, which often occurs in the context of confabulation. Suggestions for posthypnotic amnesia (PHA) are included in many standardized scales of hypnotizability, such as the Harvard Group Scale of Hypnotic Susceptibility, Form A (HGSHS:A; Shor & Orne, 1962) and the Stanford Hypnotic Susceptibility Scale, Form C (SHSS:C; Weitzenhoffer & Hilgard, 1962). These suggestions typically involve an instruction to forget the events of hypnosis until a reversibility cue is administered. Posthypnotic amnesia is readily experienced by high hypnotizable individuals who constitute approximately 10–15% of the population (Barnier & McConkey, 2004). Most important, hypnotic suggestions also have been used to successfully create amnesia for personal, autobiographical events. For instance, Barnier (2002) demonstrated that PHA for autobiographical events shares many features with functional amnesia (amnesia not due to brain injury or disease; Schacter & Kihlstrom, 1989). Barnier (2002) gave high and low hypnotizable subjects (hereafter referred to as *highs* and *lows*) a PHA suggestion to forget their first day of high school and their first day of university. Following hypnosis, she found that highs had difficulty recalling the personal semantic and autobiographical details associated with these events. For highs, both memory specificity and quality were impaired in comparison to lows. However, highs

recovered their memories of these events following the reversibility cue. Thus, the PHA suggestion temporarily limited highs' accessibility to both personal semantic information and autobiographical events. This suggests that hypnotic suggestions may also be able to reproduce the type of personal forgetting seen in clinical confabulation (see also Cox & Barnier, 2003).

The aim of this study was to create a viable hypnotic analogue of clinical confabulation. We based our study on Metcalf et al.'s (2010) suggestion that two factors combine to produce confabulation. The first factor involves disrupted memory production, and the second factor involves impaired memory evaluation/monitoring. We attempted to model the disrupted production component by developing three different hypnotic suggestions. Each suggestion was designed to shape the clinical expression of confabulation in a different way. We attempted to model the impaired evaluation/monitoring component of confabulation by giving these suggestions in the hypnotic context (which is known to disrupt belief evaluation and reality monitoring; Bryant & Mallard, 2005). This was also inspired by our work on mirrored-self misidentification delusion (Connors, Barnier, et al., 2012), where we found that suggestions administered during hypnosis produced the delusion, whereas the same suggestions administered in the nonhypnotic state did not.

In the first suggestion (*amnesia* suggestion), we attempted to impair memory production by giving subjects a suggestion for amnesia alone, since amnesia commonly occurs in clinical confabulation. We told subjects that they would not be able to remember anything that had happened since they started university. Here, we were interested in whether amnesia alone in the context of hypnosis might lead to unsuggested confabulation. In the second suggestion (*fill-in-gaps* suggestion), we attempted to impair memory production by giving subjects a suggestion for amnesia plus a suggestion to fill in any gaps in memory. We told subjects that they would not be able to remember anything that had happened since they started university and they should fill in the gaps in their memory. Here, we were interested in how subjects would fill in these memory gaps. For instance, they might completely fabricate information or they might draw upon previous experiences. In the third suggestion (*temporal-confusion* suggestion), we attempted to impair memory production by giving subjects a suggestion to disrupt the temporal order of events. We told subjects that they would not be able to remember the exact order of events that have happened since they started university, and that they would mix up these events and recall them out of order. Here, we were interested in whether subjects would generate confabulations that involved previously experienced events misplaced in time. In all three conditions, we gave subjects an instruction to forget the hypnotist's suggestion because we wanted them to be unaware of the source of their memory impairment (i.e., the

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hypnotic suggestion) similar to clinical patients who might lack insight into their condition (for a similar strategy, see Zimbardo, Andersen, & Kabat, 1981).

To test the impact of each suggestion, we administered a modified version of Dalla Barba's (1993a) Confabulation Battery (based on Metcalf et al., 2007). This included questions about personal semantic memory, personal episodic memory, and questions to which the answers should be "I don't know" (e.g., "What did you have for lunch on March 20th of this year?"). Half of the questions focused on university events (targeted by the suggestion) and half focused on school events. After cancelling the suggestion and after hypnosis, we read the confabulation battery back to subjects, reminded them of their responses and asked them about the veracity of each response to determine whether they had confabulated. If subjects indicated that their responses on the confabulation battery were inaccurate, we asked them about the source of these confabulations.

We hypothesized that highs would confabulate more than lows, especially in response to university events. We expected that highs in the *fill-in-gaps* condition would confabulate the most in response to personal semantic, episodic, and "I don't know" questions, since this suggestion encourages responding even though an appropriate memory might not be available due to amnesia. We expected highs in the *temporal-confusion* condition to recall previously experienced events in an altered temporal sequence rather than completely fabricate events. Finally, we wondered if highs in the *amnesia* condition would confabulate at all or whether they might simply be unable to remember any university events.

Method

Design and Participants

We tested 24 (3 males, 21 females) high hypnotizable subjects of mean age 21.58 years ($SD = 4.32$) and 16 low hypnotizable subjects (6 males, 10 females) of mean age 20.25 years ($SD = 3.30$) in a 2 (Hypnotizability: high vs. low) × 3 (Suggestion Condition: amnesia vs. fill in gaps vs. temporal confusion) between-subjects design. Subjects were undergraduate psychology students at Macquarie University who received credit toward their psychology course or $20 remuneration for their involvement. We carefully selected subjects on the basis of their scores on a modified 10-item version of the HGSHS:A and a modified 11-item version of the SHSS:C.[1] Highs scored 7–10 ($M = 7.96$, $SD =$

[1]The 10-item modified HGSHS:A included: head falling, eye closure, hand lowering, finger lock, moving hands together, communication inhibition, experiencing of fly, eye catalepsy, posthypnotic suggestion, and posthypnotic amnesia; arm rigidity and arm

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0.88) on the HGSHS:A and 7–11 ($M = 8.42$, $SD = 1.25$) on the SHSS:C. Lows scored 0–3 ($M = 2.16$, $SD = 1.00$) on the HGSHS:A and 0–3 ($M = 1.87$, $SD = 1.09$) on the SHSS:C.

Procedure

We tested subjects individually in 1.5-hour sessions, which involved a hypnosis session and a postexperimental inquiry. Both the hypnosis session and the inquiry were conducted by the same experimenter.

Hypnosis session. Following informed consent procedures, the hypnotist administered the SHSS:C induction and the first 10 SHSS:C suggestions. Next, she randomly assigned subjects to either the *amnesia* condition ($n = 13$), the *fill-in-gaps* condition ($n = 14$), or the *temporal-confusion* condition ($n = 13$). The verbatim suggestions for each condition were the following:

Amnesia suggestion:

Continue to remain comfortably relaxed and deeply hypnotized but listen carefully to what I say next. I would now like you to forget everything that has happened to you since you started university. That's right. I want you to completely forget everything that has happened to you since you started university. You will still be able to remember the events that happened before university but you will have no memory at all for anything that has happened since you started university. You will be unable to remember the events that have occurred since you started university and you will prefer not to try. It will be much easier just to forget everything that has happened since you started university until I tell you that you can remember. This will happen until I say, "Now you can remember everything." So you will completely forget everything that has happened since you started university. Do you understand? You will continue to experience this change in your memory — that is, you will not be able to remember anything that has happened since you started university — but you will not be aware that I gave you this instruction. A little later I will ask you about some events from your life. When answering these questions, you will not be able to remember anything that has happened since you started university. And you will not realize that this is because I gave you an instruction to forget during hypnosis. Do you understand?

immobilization items were removed to ensure that the procedure could be conducted within the time limits of a 1-hour session. The 11-item modified SHSS:C included: hand lowering, moving hands apart, mosquito hallucination, taste hallucination, arm rigidity, dream, age regression, arm immobilization, anosmia, negative visual hallucination, and posthypnotic amnesia; the auditory hallucination item was removed and the procedure was combined with the confabulation suggestion in 1.5-hour individual sessions.

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Fill-in-gaps suggestion:

Continue to remain comfortably relaxed and deeply hypnotized but listen carefully to what I say next. I would now like you to forget everything that has happened to you since you started university. That's right. I want you to completely forget everything that has happened to you since you started university. You will still be able to remember the events that happened before university but you will have no memory at all for anything that has happened since you started university. You will be unable to remember the events that have occurred since you started university and you will prefer not to try. It will be much easier just to forget everything that has happened since you started university until I tell you that you can remember. This will happen until I say, "Now you can remember everything." So you will completely forget everything that has happened since you started university. Do you understand? You will continue to experience this change in your memory — that is, you will not be able to remember anything that has happened since you started university — but you will not be aware that I gave you this instruction. However, you will fill in the gaps in your memory. A little later I will ask you about some events from your life. When answering these questions, you will not be able to remember anything that has happened since you started university. And you will not realize that this is because I gave you an instruction to forget during hypnosis. However, you will fill in the gaps in your memory so you can answer these questions. Do you understand?

Temporal-confusion suggestion:

Continue to remain comfortably relaxed and deeply hypnotized but listen carefully to what I say next. I would now like you to forget the exact order of events that have happened to you since you started university. That's right. I want you to completely forget the correct order of events that have happened since you started university. You will still be able to remember the order of events that happened before university but you will have no memory for the exact order of events that have happened since you started university. You will be unable to remember the order of events that have occurred since you started university and you will prefer not to try. It will be much easier just to forget the order of events that have happened since you started university until I tell you that you can remember. This will happen until I say, "Now you can remember everything." So you will completely forget the correct order of events that have happened since you started university. Do you understand? You will continue to experience this change in your memory — that is, you will not be able to remember the correct order of events that have happened since you started university — but you will not be aware that I gave you this instruction. However, you will mix up the order of these events and recall them out of order. So, you will be unable to recall exactly when things happened and you will remember these events in a different order. A little

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> later I will ask you about some events from your life. When answering these questions, you will recall events that have happened since you started university out of order. And you will not realize that this is because I gave you an instruction to do this during hypnosis. Do you understand?

The hypnotist then gave all subjects a deepening suggestion, where she counted from 1 to 5 while instructing subjects to become more deeply hypnotized.

Confabulation Battery. To test the impact of the suggestion, the hypnotist asked subjects to complete a modified version of Dalla Barba's (1993a) Confabulation Battery. This consisted of six questions indexing personal semantic memory (three questions about university, e.g., "Which year did you start university?"; three questions about school, e.g., "What high school did you go to?"), six questions indexing personal episodic memory (three questions about university, e.g., "How did you spend your first day at university?"; three questions about school, e.g., "Tell me about a birthday party you went to during high school"), and six questions to which the answers should be "I don't know" (three questions about university e.g., "What did you have for lunch on March 20th of this year?"; three questions about school, e.g., "What did you do on March 13th when you were in Year 8?"). The complete confabulation battery is in the Appendix.

Next, the hypnotist cancelled the confabulation suggestion and administered the SHSS:C deinduction (including the posthypnotic amnesia suggestion; Weitzenhoffer & Hilgard, 1962). She then tested and cancelled the SHSS:C posthypnotic amnesia suggestion before proceeding to the postexperimental inquiry.

Postexperimental inquiry. In the postexperimental inquiry, the hypnotist asked subjects to describe their experience of completing the Confabulation Battery, especially for university events. The hypnotist then reminded subjects of each question and the responses they had provided and asked them whether each response had been correct. If subjects indicated that any of their responses had been incorrect, they were asked, "Where did that incorrect information come from?" To conclude the session, the hypnotist debriefed subjects, invited them to ask questions and thanked them for their time.

Results

Questions Answered

Analyses first examined the number of questions answered (whether true or confabulated) on the Confabulation Battery. Table 1 presents

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Table 1
Questions Answered

	Personal Semantic		Episodic		"I don't know"	
	University	School	University	School	University	School
Highs						
Amnesia	2.25 (0.89)	3.00 (0.00)	1.25 (1.04)	2.50 (0.53)	0.38 (0.52)	0.38 (0.52)
Fill in Gaps	2.75 (0.46)	2.88 (0.35)	2.13 (0.99)	3.00 (0.00)	0.75 (1.16)	1.25 (1.04)
Temp. Conf.	3.00 (0.00)	2.75 (0.46)	2.75 (0.46)	3.00 (0.00)	0.13 (0.35)	0.63 (0.52)
Lows						
Amnesia	3.00 (0.00)	3.00 (0.00)	2.00 (1.00)	2.80 (0.45)	0.00 (0.00)	0.00 (0.00)
Fill in Gaps	3.00 (0.00)	3.00 (0.00)	2.67 (0.82)	2.83 (0.41)	0.33 (0.52)	0.00 (0.00)
Temp. Conf.	3.00 (0.00)	3.00 (0.00)	3.00 (0.00)	3.00 (0.00)	0.80 (0.84)	0.60 (0.55)

Note. Maximum number of each type of memory is 3. Standard deviations are in parentheses.

these data according to hypnotizability, suggestion condition, question type, and time period. For personal semantic questions, a 2 (Hypnotizability: high vs. low) × 3 (Suggestion Condition: amnesia vs. fill in gaps vs. temporal confusion) × 2 (Time Period: university vs. school) analysis of variance (ANOVA) of the number of answers yielded a significant main effect of Hypnotizability, $F(1, 34) = 7.69$, $p < .01$, $\beta = .18$. Lows answered more personal semantic questions ($M = 6.00$, $SD = 0.00$) than highs ($M = 5.54$, $SD = 0.66$), although both highs and lows answered all or almost all questions (max. number of answers = 6).

For episodic questions, a 2 (Hypnotizability) × 3 (Suggestion Condition) × 2 (Time Period) ANOVA of the number of answers yielded a significant main effect of time period, $F(1, 34) = 12.03$, $p < .01$, $\beta = 0.26$. Subjects answered more episodic questions about school events ($M = 2.85$, $SD = 0.36$) than about university events ($M = 2.25$, $SD = 0.98$). There also was a significant main effect of Hypnotizability, $F(1, 34) = 5.02$, $p = .03$, $\beta = 0.13$. Lows answered more episodic questions ($M = 5.44$, $SD = 0.81$) than highs ($M = 4.88$, $SD = 1.15$). Finally, there was a significant main effect of Suggestion Condition, $F(2, 34) = 13.69$, $p < .01$, $\beta = 0.45$. A follow-up one-way ANOVA with post hoc Scheffe comparisons (controlling Type I error at $p = .05/3$) revealed that subjects in the amnesia condition answered fewer questions ($M = 4.15$, $SD = 0.99$) than subjects in the temporal-confusion condition ($M = 5.85$, $SD = 0.38$), $p < .01$, and fewer questions than those in the fill-in-gaps condition ($M = 5.29$, $SD = 0.91$), $p < .01$. There was no difference between the temporal-confusion and fill-in-gaps conditions.

For "I don't know" questions, a 2 (Hypnotizability) × 3 (Suggestion Condition) × 2 (Time Period) ANOVA of the number of answers yielded a significant interaction between Hypnotizability and Suggestion Condition, $F(2, 34) = 4.45$, $p = .02$, $\beta = 0.21$. However, two separate follow-up one-way ANOVAs with post hoc Scheffe comparisons (controlling Type I error at $p = .05/3$) revealed no significant effects. A detailed examination of subjects' responses indicated that both highs and lows in all suggestion conditions were willing to respond to these questions by saying "I don't know."

As expected, in terms of the number of questions answered, the confabulation suggestion impaired memory for university events targeted by the suggestion, influenced highs more so than lows, and the amnesia version of the suggestion produced the most forgetting.

Questions Confabulated

Subjects were scored as confabulating if they indicated to the hypnotist in the postexperimental inquiry that they had provided incorrect responses on the Confabulation Battery (e.g., fabricated memories, confused memories in time and/or place). Also, all responses to "I don't know" questions were scored as confabulation. Table 2 presents these

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Table 2
Questions Confabulated

	Personal Semantic		Episodic		"I don't know"	
	University	School	University	School	University	School
Highs						
Amnesia	1.25 (1.49)	0.00 (0.00)	0.75 (1.16)	0.00 (0.00)	0.38 (0.52)	0.38 (0.52)
Fill in Gaps	1.13 (0.83)	0.00 (0.00)	0.25 (0.71)	0.00 (0.00)	0.75 (1.16)	1.25 (1.04)
Temp. Conf.	0.00 (0.00)	0.13 (0.35)	0.13 (0.35)	0.13 (0.35)	0.13 (0.35)	0.63 (0.52)
Lows						
Amnesia	0.20 (0.45)	0.00 (0.00)	0.20 (0.45)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
Fill in Gaps	0.17 (0.41)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.33 (0.52)	0.00 (0.00)
Temp. Conf.	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.80 (0.84)	0.60 (0.55)

Note. Maximum number of each type of memory is 3. Standard deviations are in parentheses.

data for personal semantic, episodic, and "I don't know" questions according to hypnotizability, suggestion condition, question type, and time period. As indicated in Table 2, the total number of self-reported confabulations was generally quite low (highs $M = 2.42$, $SD = 2.41$; lows $M = 0.75$, $SD = 0.93$). Further, subjects rarely confabulated in response to high school events ($M = 0.58$, $SD = 0.78$), which is to be expected since the confabulation suggestions did not target this time period. Thus, in the following analyses, we only consider confabulation in response to university events.

For personal semantic questions, a 2 (Hypnotizability) × 3 (Suggestion Condition) between-subjects ANOVA of the number of confabulations yielded a significant main effect of Hypnotizability, $F(1, 34) = 6.62$, $p = .02$, $\beta = 0.16$. Highs confabulated in response to personal semantic questions ($M = 0.79$, $SD = 1.10$) more than lows ($M = 0.13$, $SD = 0.34$). There also was a near-significant main effect of Suggestion Condition, $F(2, 34) = 3.05$, $p = .06$, $\beta = 0.15$. A separate follow-up one-way ANOVA with post hoc Scheffe comparisons (controlling Type I error at .05/3) approached significance, suggesting that the amnesia suggestion tended to produce more confabulation ($M = 0.85$, $SD = 1.28$) than the temporal confusion suggestion ($M = 0.00$, $SD = 0.00$), $p = .06$.

For episodic questions, a 2 (Hypnotizability) × 3 (Suggestion Condition) between-subjects ANOVA of the number of confabulations yielded no significant main effects or interactions (all ps $> .15$). Similarly, for "I don't know" questions, a 2 (Hypnotizability) × 3 (Suggestion Condition) between-subjects ANOVA of the number of confabulations yielded no significant main effects or interactions (all ps $> .09$). Thus, the confabulation suggestion did not appear to influence episodic memory or responses to "I don't know" questions.

Summary

As expected, the *amnesia* suggestion was successful at producing the most forgetting. Subjects forgot more information from university than school and highs experienced more forgetting than lows. When we examined confabulation, we found that subjects did not confabulate about high school events. However, for university events, subjects confabulated on questions indexing personal semantic information rather than episodic questions or "I don't know" questions. For these personal semantic questions, highs confabulated more than lows and the *amnesia* suggestion tended to produce more confabulation than the *temporal confusion* suggestion (which did not lead to any confabulation).

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Discussion

The aim of this study was to create a hypnotic analogue of clinical confabulation. We developed three hypnotic confabulation suggestions inspired by three theoretical views about the nature of confabulation. We perceived these three suggestions as three potential Factor 1s—*amnesia, fill in gaps*, and *temporal confusion*—and we considered whether the hypnotic context, which is known to disrupt critical evaluation (Bryant & Mallard, 2005), might play the role of Factor 2. Within this framework, we hoped that Factor 1 and Factor 2 would combine to produce confabulations similar to those seen in clinical contexts.

First, we demonstrated that the suggestion for amnesia alone was successful in producing forgetting. When we examined the number of questions answered, we found that subjects who received the amnesia suggestion answered fewer questions, especially about episodic events. The target time period for our amnesia suggestion involved events that occurred since subjects started university. Targeting amnesia in this way was successful since subjects answered fewer questions about university compared to high school. The amnesia suggestion encompassed what Conway and Pleydell-Pearce (2000) labeled a *lifetime period* in their hierarchical model of autobiographical remembering. According to this model, lifetime periods have identifiable beginnings and ends and often involve a theme (e.g., "the time I worked at X," "when I lived in Y"). Forgetting entire lifetime periods, as required by those in the amnesia condition, may be easier than more specific types of forgetting (e.g., forgetting the temporal order of events). Indeed, in previous work (Cox & Barnier, 2003), we found that high hypnotizable individuals were more successful in forgetting their entire first romantic relationship (a lifetime period) than they were in forgetting selected events that occurred during this relationship. These findings suggest that for subjects in the amnesia condition, we successfully created a potential Factor 1.

Second, we demonstrated that for high hypnotizable individuals, hypnotic suggestions can produce confabulations similar to those seen in clinical settings. Although the total amount of confabulation was relatively low, the proportion of confabulations made by highs on our 18-item Confabulation Battery was 13%, which is consistent with proportions seen in some clinical populations. For example, La Corte, Serra, Attali, Boissé, and Dalla Barba (2010) found that the proportion of confabulations made by a group of patients with Alzheimer's disease and confabulating amnesics on a 165-item Confabulation Battery was 14%. Similarly, Kessels, Kortrijk, Wester, and Nys (2008) found that the proportion of confabulations made by Korsakoff patients on a 64-item Confabulation Battery ranged from 11–48%. The types of confabulations elicited by our hypnotized subjects were provoked and mostly mundane. For instance, when we asked, "What did you do on

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March 13th when you were in Year 8?," they replied with confabulations such as "I sat in the playground with friends underneath a tree." The Confabulation Battery that we administered did not provide much opportunity for bizarre confabulation (i.e., the questions involved mundane, everyday events), yet some individuals produced unusual and clearly incorrect memories. For example, a number of subjects commented that they had not started university yet, which was clearly incorrect because all subjects were university students.

Importantly, we demonstrated that the amnesia suggestion, combined with a lack of awareness about the source of the amnesia, was the most successful way to create confabulation in the laboratory. High hypnotizable subjects confabulated the most in response to the amnesia suggestion, less often for the fill-in-gaps suggestion, and rarely for the temporal-confusion suggestion. Interestingly, the way that highs in the amnesia condition confabulated was via temporal confusions. For instance, 1 high in the amnesia condition reported during hypnosis that her favorite current subject was business studies. However, during the postexperimental inquiry she said, "I did business studies at school! I had no idea I was at university. I don't do business studies at university!" So whereas an explicit temporal confusion suggestion was unsuccessful, those who received the amnesia suggestion confused the temporal order of the events they recalled.

We found also that confabulation was more common in response to questions indexing personal semantic memory rather than questions indexing episodic memory or "I don't know" questions. This difference is not predicted by any of the theoretical views of confabulation, since in clinical situations patients confabulate both about personal facts (i.e., personal semantic information) and previous experiences (i.e., episodic information). If our high hypnotizable subjects were confabulating by transposing their high school lifetime period into the present, they may have found it easier to transpose semantic information as opposed to episodic events. For example, perhaps high school episodes that involved different friendship groups or different hobbies were too complex to transpose into the present day. This implies that at some level, episodic confabulation may have been inhibited for our high hypnotizable subjects, who preferred to not respond to episodic questions.

It is interesting to note that the suggestion for amnesia alone (without awareness of the source of the amnesia) was sufficient to produce confabulation. We thought that perhaps the amnesia suggestion would lead just to forgetting and that subjects would say they could not remember the answers to questions about university. As noted in the introduction, creating hypnotic confabulation via a Factor 1 suggestion (e.g., amnesia) administered during hypnosis is quite different to previous research where the hypnotist has suggested false events that

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are to be remembered (for a review, see McConkey et al., 1998). In the present study, the Factor 1 amnesia suggestion combined with a Factor 2 evaluation impairment provided by the hypnotic context to produce confabulation.

As noted above, our fill-in-gaps suggestion and temporal-confusion suggestion were less successful in producing confabulation than our amnesia suggestion. This may be because we attempted to impose an explicit strategy on subjects that may have disrupted or interfered with their natural strategy. Similar processes are thought to underlie explicit monitoring theories of choking under pressure where it is argued that performance pressure makes individuals pay excessive attention to skill processes that interferes with their ability to execute a skill (Baumeister, 1984; Beilock & Carr, 2001; Masters, 1992). Also, theories of retrieval disruption in collaborative inhibition suggest that an individual's natural memory retrieval strategies become disrupted when they are exposed to the retrieval strategies of other group members (B. H. Basden, Basden, Bryner, & Thomas, 1997; D. R. Basden & Basden, 1995). Perhaps the amnesia suggestion produced a gap in memory and allowed subjects to fill this gap naturally, whereas the fill-in-gaps and temporal-confusion suggestions inhibited confabulation by enforcing a particular strategy. In work that has used hypnosis to model mirrored-self misidentification delusion (the delusional belief that I see a stranger when I look in the mirror), we found that a hypnotic suggestion to see a mirror as a window with a view of a stranger was less successful in producing the delusion (Barnier et al., 2008) than a suggestion to simply not understand how mirrors work (Connors, Cox, et al., 2012). That is, enforcing specific strategies or overprescribing what hypnotized subjects should do may be less effective than providing minimal instructions and allowing subjects to interpret and act upon them in their own way.

Laying aside these differences between suggestions, our results indicate that the two-factor theory of delusions may also apply to clinical confabulation (at least to those created temporarily via an amnesia suggestion). Future work needs to confirm whether the hypnotic context is indeed playing the role of Factor 2. According to Turner and Coltheart (2010), under normal conditions, unconscious processes check memories for plausibility and tag any memories that require further conscious checking. Factor 2 in confabulation might involve a failure of this checking system to tag doubtful memories. A failure such as this would allow source errors to occur because information from other sources (e.g., imagination) might not be tagged as doubtful and instead might be classified as a genuine previous experience. In support of this, Turner and colleagues (2010) found that clinical confabulators make both source- and reality-monitoring errors. Specifically, clinical confabulators correctly determined that previously seen images were familiar but they

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could not determine the source of this familiarity. These patients also had difficulty discriminating imagined words from words that had been read aloud by the experimenter. If confabulators are making source- and reality-monitoring errors, it makes hypnosis an ideal technique for modeling them in the laboratory because the hypnotic context can disrupt these processes (Bryant & Mallard, 2005; Heaps & Nash, 2001; McConkey, 2008) and may thus play the role of Factor 2.

One useful approach that can examine the role of hypnosis as Factor 2 involves giving some subjects a suggestion during hypnosis and giving others the same suggestion without hypnosis. We applied this technique to our research on hypnotic mirrored-self misidentification where we gave subjects a Factor 1 suggestion that they would be unable to recognize the face in the mirror (designed to model the proposal that Factor 1 in this delusion is a face-processing deficit). We gave half of our subjects this suggestion during hypnosis and gave the other half the suggestion in their nonhypnotic state. Only subjects who received the suggestion during hypnosis experienced the complete delusion and said they saw a stranger in the mirror (Connors, Barnier, et al., 2012). This suggests that hypnosis played the role of Factor 2 by disrupting belief evaluation and preventing the delusion from being rejected as untrue. We can apply a similar technique to a hypnotic analogue of confabulation by giving half of our subjects an amnesia suggestion during hypnosis and the other half an amnesia suggestion without hypnosis. We can then test the impact of Factor 1 and Factor 2 separately and combined, which may offer insight into the role of these underlying factors and/or may help refine particular theoretical viewpoints.

In summary, we have demonstrated that hypnosis can model some types of provoked confabulation, similar to those seen in clinical contexts. In doing so, we have raised some useful questions for both the modeler and the theorist about the nature and underlying processes involved in confabulation. Using our hypnotic technique as a foundation, we can trial modifications to increase the rate of confabulation, to elicit more bizarre confabulations, or to produce confabulation for episodic memories. If we can model clinical confabulation in this way, we can next explore techniques to lessen conviction in these types of memories, which may eventually be applied in clinical settings.

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Appendix

Confabulation Battery

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Personal Semantic Memory Questions:

1.What high school did you go to?
2.Which year did you start university?
3.What subjects have you studied so far at university?
4.What were the names of some of your closest friends at high school?
5.Which teachers did you have during your final year of high school?
6.Which of the subjects that you are currently studying is your favorite?

Episodic Memory Questions:

1.Tell me about a school excursion you went on during high school?
2.How did you spend your first day at university?
3.What did you do after completing your final high school exams?
4.Can you tell me about the most interesting tutorial you have had so far at university?
5.What did you do last Saturday?
6.Tell me about a birthday party you went to during high school?

"I don't know" Questions:

1.What did you do on March 13th when you were in Year 8?
2.What did you have for dinner on the first Tuesday of August in your final year of high school?
3.What did you do on Thursday in Week 3 of semester this year?
4.What did you do straight after waking up on April 3rd of this year?
5.What did you do during the Easter holidays when you were in Year 9?
6.What did you have for lunch on March 20th of this year?

Eine Hypnotische Analogie Klinischer Konfabulation

Rochelle E. Cox und Amanda J. Barnier

Abstrakt: Konfabulation, also erfundene oder veränderte Erinnerungen einer Person von sich selbst, findet sich in vielen Erkrankungen. Doch es gibt keine verlässliche Technik dafür, sie unter Laborbedingungen zu messen. Die Autoren benutzen Hypnose, um klinische Konfabulation mittels Suggestionen an die Teilnehmer, hervorzurufen. Eine der Suggestionen

beinhaltete eine Amnesie für alles was seit ihrem Start an der Universität passiert war, eine andere eine Amnesie für die Universität und zusätzlich eine Instruktion, die Gedächtnislücken zu füllen und eine dritte Variation bestand in der Konfusion bezüglich der zeitlichen Abfolge universitärer Ereignisse. Daraufhin wurden verschiedene Typen der Erinnerung mittels der confabulation battery indiziert. Die Suggestion der Amnesie rief die meisten Konfabulationen, und dabei vor allem solche in bezug auf persönliche semantische Informationen, hervor. Die Autoren diskutieren die theoretischen Implikationen dieses ersten Ansatzes, Konfabulationen klinisch darstellbar zu machen, und die potentielle Nutzbarkeit solcher Analogien.

Stephanie Reigel, MD

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Un analogue hypnotique de confabulation clinique

Rochelle E. Cox et Amanda J. Barnier

Résumé: La confabulation, soit la fabrication ou la déformation de souvenirs à propos de soi-même, est présente dans nombreux troubles psychologiques, mais il n'existe pas de technique fiable pour procéder à son investigation en laboratoire. Les auteurs ont utilisé l'hypnose pour modéliser une confabulation clinique en donnant aux sujets l'une ou l'autre des suggestions suivantes: 1) l'amnésie de tout ce qui s'était passé depuis leur entrée à l'université; 2) l'amnésie liée à ce qui s'est passé à université en y ajoutant une instruction pour combler les lacunes de leur mémoire; ou 3) une confusion quant à l'ordre chronologique de ces événements universitaires. Ils ont ensuite indexé différents types de mémoire à l'aide d'un test de confabulation. La suggestion d'amnésie est celle ayant produit le plus de confabulation, particulièrement en ce qui a trait à l'information sémantique personnelle. La confabulation des sujets se caractérisait surtout par de la confusion temporelle. Les auteurs ont abordé les implications théoriques de cette première tentative de modéliser la confabulation et l'utilité potentielle de tels analogues.

Johanne Reynault
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Un análogo hipnótico de la confabulación clínica

Rochelle E. Cox y Amanda J. Barnier

Resumen: La confabulación –memorias fabricadas o distorsionadas sobre uno mismo- ocurre en muchos trastornos, pero no existe alguna técnica fiable para evaluarla en el laboratorio. Los autores utilizaron la hipnosis para modelar la confabulación clínica al darle a los sujetos una sugerencia ya sea de: (1) amnesia para todo lo ocurrido desde el comienzo de la universidad, (2) amnesia para la universidad más la instrucción de llenar huecos en la memoria, o (3) confusión sobre el orden temporal de eventos universitarios. Después los sujetos indexaron distintos tipos de memoria en una batería de confabulación. La sugerencia de amnesia produjo la mayor confabulación,

especialmente para información semántica personal. Notoriamente, los sujetos confabularon mediante la realización de confusiones temporales. Los autores discuten las implicaciones teóricas del primer intento de modelar la confabulación clínica y la utilidad potencial de estos análogos.

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