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Posthypnotic amnesia for a first romantic relationship: Forgetting the entire relationship versus forgetting selected events

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This experiment investigated the impact of suggestion focus on posthypnotic amnesia (PHA) for memories of a first romantic relationship. During hypnosis, high and low hypnotisable participants recalled specific memories from this period in response to 10 cue phrases (Elicitation). They then received a PHA suggestion that targeted either the entire period or specific memories from that period. Participants' explicit memory was indexed by cued recall after PHA was administered (memories recalled to ''old'' and ''new'' cues; Recall 1) and after it was cancelled (Recall 2). A social judgement task indexed dissociations between implicit and explicit memory. PHA had the greatest impact on highs', but not lows', memory performance (in terms of memories recalled to old cues, recall latency, and qualitative memory ratings) when the suggestion targeted the entire period rather than specific events. We discuss these findings in terms of the parameters of PHA's influence on memory, its value for exploring the nature and structure of autobiographical memory, and its utility as a laboratory analogue of functional amnesia.

Functional amnesia is a clinical disorder of memory characterised by extreme, and subjectively compelling, disturbances in personal memory. It is defined as memory loss ''attributable to an instigating event or process that does not result in damage or injury to the brain, and produces more forgetting than would normally occur in the absence of an instigating event or process'' (Schacter & Kihlstrom, 1989, p. 209). Functional amnesia involves three major features: (1) a subjectively compelling apparent inability to consciously access memories (i.e., disrupted explicit memory), (2) a continuing influence of the ''forgotten'' information on behaviour, thought, and action (i.e., a dissociation between implicit and explicit memory), and (3) reversibility of the effect (Christianson & Nilsson, 1984; Eich, Macauley, Loewenstein, & Dihle, 1997; Kihlstrom & Schacter, 1995; Schacter & Kihlstrom, 1989). This pattern of performance implicates extreme shifts in the accessibility of memory material, rather than normal forgetting (i.e., simple memory decay over time; Barnier, 2002; Barnier, Bryant, & Briscoe, 2001; Bryant, Barnier, Mallard, & Tibbits, 1999; Kihlstrom, 1985). Most importantly, functional amnesia revolves around the forgetting of autobiographical memories and information (Bryant, 1995; Schacter, Kihlstrom, Canter Kihlstrom, & Berren, 1989).

Systematic empirical investigation of memory inhibition in functional amnesia has been somewhat limited by its transient and complex nature. However, both theoretical comment and recent research are converging on the view that posthypnotic amnesia (PHA) shares major features (if not the mechanism) with functional amnesia, and

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thus may provide a valuable laboratory paradigm within which to model and explore such disorders of personal memory (Barnier, 2002; Barnier & McConkey, 1999; Kihlstrom & Schacter, 1995; Neisser, 1967). Posthypnotic amnesia (PHA) is a classic hypnotic phenomenon that involves suggesting to a hypnotised person that following hypnosis they will be unable to recall material, typically stimuli learned or events experienced during hypnosis, until they receive a reversibility cue. For high, but not low, hypnotisable individuals PHA (like functional amnesia), leads to disrupted explicit memory, discrepancies between implicit and explicit memory, and reversibility. PHA has been described as a temporary, retrieval-based dissociation between episodic and semantic memory (Kihlstrom, 1985, 1998; for alternative accounts, see Coe, 1978; Husemann, Gruder, & Dorst, 1987; Spanos, 1986).

Whereas most research on PHA has focused on relatively simple, nonpersonal material such as lists of words or the events of hypnosis (for a review, see Kihlstrom, 1985), some research has indicated that PHA also can influence individuals' recall of autobiographical episodes. For instance, Barnier (2002; see also Barnier & McConkey, 1999) targeted high and low hypnotisable participants' memories of their first day of high school and their first day of university. She found that highs', but not lows', explicit recall (of personal semantic facts about and memorable incidents from those episodes) was temporarily impaired following the PHA suggestion. However, highs and lows performed similarly on implicit memory tasks (category generation and social judgement). Barnier and Wright (2001) targeted high, medium, and low hypnotisable participants' memories of celebrating their last birthday and last Christmas. They found that for highs, more so than mediums and lows, the PHA suggestion influenced the accessibility and quality (i.e., specificity, narrative quality, and subjective characteristics) of participants' memories of these events.

These findings are the first to demonstrate that PHA can create selective forgetting and recovery of autobiographical events in the laboratory in a manner consistent with functional amnesia. Nevertheless, the precise impact of a PHA suggestion on personal memory remains unclear. In summarising existing case reports of functional amnesia, Schacter (1996) noted that forgetting can involve a total loss of memory (and even identity), an extensive loss of memory but with a ''preserved'' island of memory, or the loss of memory for a single event or a small number of experiences. In other words, personal forgetting can be either broad sweeping or relatively circumscribed. Yet most suggestions for PHA have been global, rather than selective in nature; suggestions have focused on complete lists of words, all of the events of hypnosis, or entire autobiographical episodes (e.g., Barnier, 2002; Barnier et al., 2001; Kihlstrom, 1980; Kihlstrom & Evans, 1976; Spanos, Radtke, & Dubreuil, 1982). The present experiment extended recent work by examining the impact of the focus of a PHA suggestion on autobiographical memory. In turn, the PHA paradigm allowed us to explore the nature, structure, and inhibition of autobiographical memories.

Our investigation was informed by Conway and Pleydell-Pearce's (2000) model of autobiographical memory, which in highlighting both the interconnectedness of autobiographical knowledge and motivational influences on its retrieval, may predict the impact of attempts to inhibit personal memory; in this case, via a PHA suggestion. Conway and Pleydell-Pearce's (2000) model has four major features. First, autobiographical memory is organised. Their hierarchical model specifies three levels of autobiographical knowledge: lifetime periods, general events, and event-specific knowledge. At the top of the hierarchy, *lifetime periods* refer to periods of time measured in months, years, and decades, which contain general themes about the self (e.g., when I attended high school) and have identifiable beginnings and endings. At the next level, *general events* refer to periods of time measured in days, weeks, and even months, which encompass personal themes and goal attainment relating to specific sets of events or to extended events (including repeated events and first time experiences). Finally, *event-specific knowledge* refers to time periods measured in seconds, minutes, and hours, and is highly detailed, generally sensory in nature, and strongly related to imagery. The second feature of the model is that autobiographical knowledge is strongly linked in an associative network. Within the hierarchical knowledge base, knowledge structures are linked via indices and an autobiographical memory represents a stable pattern of activation across the indices. Notably, activation across these levels is also diffuse, such that knowledge held in lifetime periods can access many associated general events, and knowledge held in general events can access many associated general events, a lifetime

period, and many records of event-specific knowledge. Third, autobiographical memory is intimately connected to the self via a ''self-memory system''. Conway and Pleydell-Pearce (2000) proposed that the self, and especially current goals of the self, function as central or executive control processes that modulate the construction (i.e., retrieval) of memories. The fourth and final feature is that these control processes may be inhibitory as well as facilitatory. Specifically, autobiographical knowledge that is discrepant with current goals of the self may be actively prevented from entering consciousness. Within this model, a PHA suggestion may be conceptualised as: (1) related to the hypnotised individual's current goal of experiencing as genuine the suggested effect, in this case, amnesia (McConkey, 1991; Sutcliffe, 1960); and (2) instigating executive control processes that (consciously or unconsciously) inhibit particular autobiographical knowledge in order to meet this goal. Thus, certain memories may be defined or ''tagged'' (Husemann et al., 1987) as ''things I should not/cannot remember'' (see also, Smith, Morton, & Oakley, 1998).

This account predicts two possible effects of a PHA suggestion to inhibit autobiographical memories. As activation across and within autobiographical knowledge levels is diffuse, events targeted by the suggestion will be associated with related, but nontargeted, specific knowledge (and even general events and lifetime periods). This association may result in the nontargeted knowledge also becoming subject to inhibitory control processes. That is, it may also be defined or tagged as to-be-forgotten and result in impaired recall of both targeted and nontargeted (but related) events. This prediction is conceptually consistent with Allen, Iacono, Laravuso, and Dunn's (1995) finding that high, but not low, hypnotisable individuals demonstrated impaired recognition not just for a list of words targeted by a PHA suggestion, but also a list of words not targeted by the suggestion. Alternatively, the associative nature of autobiographical knowledge may render a PHA suggestion for personal memories relatively unsuccessful because knowledge not targeted by the suggestion, but linked across the indices, may act as retrieval cues for the targeted material. Thus, irrespective of whether information is tagged as to-be-forgotten, and not remembering it serves a current goal of the self, the presence of strong retrieval cues may limit the success of inhibition, and thus the degree of amnesia (Kihlstrom & Barnhardt, 1993; Tulving, 1974; for a discussion of the impact of retrieval cues on inhibition within the directed forgetting paradigm, see MacLeod, 1998).

In this experiment, we explored the inhibition of autobiographical memories within a posthypnotic amnesia paradigm. Specifically, we examined whether the success of a PHA suggestion is determined by its focus. A global suggestion that targets the ''top level'' of the hierarchy (i.e., lifetime periods) may lead to more forgetting than a specific suggestion that targets the ''bottom level'' of the hierarchy (i.e., specific knowledge or events) for two reasons. In targeting all memories in a particular period, a global suggestion may capitalise on all related memories being defined or tagged in terms of the goal to not remember, and may minimise the number of (nontargeted) related events that act as retrieval cues.

To test this, during hypnosis high and low hypnotisable individuals recalled specific events from their first romantic relationship (which we considered a ''lifetime period'')[1] in response to 10 cue phrases (Elicitation). They then received a PHA suggestion that targeted either the entire period (*lifetime version*) or the specific memories from this period (*specific version*). Following hypnosis, explicit memory was tested via cued recall before and after PHA was cancelled (Recall 1 and 2, respectively). To assess memory for targeted versus nontargeted events from this period, at Recall 1, participants were asked to recall events in response to five cues presented during Elicitation (''old cues'') and five cues not previously presented (''new cues''). In addition, a social judgement task was used to index the dissociation between implicit and explicit memory; specifically, participants made ratings that either did or did not depend on conscious recollection of the targeted events (Barnier, 2002).

We expected highs, but not lows, to show a temporary, reversible impairment of explicit recall. Also, consistent with previous research (e.g., Barnier, 2002; Barnier et al., 2001), we expected highs to show a dissociation between implicit and explicit memory, whereby their performance on the social judgement task would be

[1] Although a first romantic relationship does not encompass an entire lifetime, we referred to this period as a ''lifetime period'' consistent with Conway and Pleydell-Pearce's definition (as a period measured in months, years, and decades, which contains general themes about the self and has an identifiable beginning and ending).

influenced by the ''forgotten'' events. Most importantly, we predicted that the focus of the PHA suggestion would influence highs' recall in terms of the number of memories generated, recall latency, and the quality of memories. Whereas individuals given the lifetime version of the suggestion might show poorer recall of both previously elicited as well as not previously elicited (but related) memories from this period, those given the specific version might show poorer recall of only previously elicited (and thus targeted) memories, and not other memories from this period. We were also interested in testing other potential effects of suggestion focus. If nontargeted events act as retrieval cues for targeted events, then the specific version should be associated with less forgetting than the lifetime version, which targets all related memories. However, if PHA's effect ''diffuses'' (via inhibitory control processes) to nontargeted (but related) events, then the specific version may result in a similar pattern of forgetting to the lifetime version, particularly for nontargeted events.

METHOD

Participants

A total of 24 high hypnotisable (7 male, 17 female; age $M = 19.75$, $SD = 6.26$) and 24 low hypnotisable (8 male, 16 female; age $M = 21.00$, $SD = 6.57$) undergraduate students at the University of New South Wales participated in return for course credit. They were selected on the basis of their extreme scores on a 10-item modified version of the Harvard Group Scale of Hypnotic Susceptibility, Form A (HGSHS: A; Shor & Orne, 1962) and were classified as high and low on the basis of their scores on a 10-item tailored version of the Stanford Hypnotic Susceptibility Scale, Form C (SHSS:C; Weitzenhoffer & Hilgard, 1962).[2] Highs scored in the range of 7 to 10 on the HGSHS:A ($M = 8.33$, $SD = .82$) and in the range of 8 to 10 on the SHSS:C ($M = 9.04$, $SD = .86$). Lows scored in the range of 0 to 3 on the HGSHS:A ($M = 2.06$, $SD = 1.06$) and the SHSS:C ($M = 2.00$, $SD = 1.06$). All highs, but no lows, passed PHA items on the HGSHS:A and SHSS:C.

[2] The 10-item modified HGSHS: A included the following items: 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 immobilisation were removed to ensure that the procedure did not exceed the time limits of a 1 hour class. The 10-item tailored SHSS:C included the following items: hand lowering, moving hands apart, mosquito hallucination, taste hallucination, arm rigidity, dream, age regression, arm immobilisation, negative visual hallucination, and posthypnotic amnesia.

Materials

A list of 15 cue phrases was used in this experiment to elicit and test autobiographical memories. This list was divided into three 5-item subsets (A, B, C) for the cued recall tests (at Elicitation, Recall 1, Recall 2), as well as the social judgement task (used to index a dissociation between implicit and explicit memory). Subset A included: ''going to a party'', ''having an argument'', ''going shopping'', ''someone making you feel jealous'', and ''going out to dinner''. Subset B included: ''a day out with friends'', ''giving or receiving a gift'', ''a family event'', ''talking on the phone'', and ''an embarrassing moment''. Subset C included: ''doing something outdoors'', ''sharing a snack'', ''receiving a surprise visit'', ''driving somewhere'', and ''going to the movies''. Participants were randomly assigned to one of three combinations of subsets across the tasks; combinations were counterbalanced across conditions (see Table 1).

The cued recall test at Elicitation consisted of a verbally presented list of 10 cue phrases (e.g., Subsets A and B). At Recall 1, the cued recall test consisted of a verbally presented list of 10 cue phrases; 5 presented at Elicitation (''old cues''; e.g., Subset B) and 5 not previously presented (''new cues''; e.g., Subset C). At Recall 2, the cued recall test consisted of a verbally presented list of the 10 cue phrases used at Elicitation (e.g., Subsets A and B). The social judgement task, which drew on conceptually similar tasks in implicit social cognition (e.g., the ''false fame'' effect, Jacoby, Kelley, Brown, & Jasechko, 1989; Squire & McKee, 1992), consisted of a verbally presented list of possible life events. Ten events were from the Life Events Inventory (e.g., ''had a shot at the doctors'', ''adopted a lost animal''; Garry, Manning, Loftus, & Sherman, 1996), five were common relationship events generated by pilot participants (e.g., ''boyfriend or girlfriend went on a holiday without them'', ''kissed a boy or girl for the first time''), and five were short descriptions of participants' own memories given during Elicitation to five cue phrases (e.g., Subset A). Participants rated the 20 events on a 7-point ''likelihood'' scale (i.e., how likely is it that 95% of

TABLE 1
Summary of combinations and cue phrase subsets across memory tasks

	Cue phrase subsets used			
Combination	*At Elicitation*	*At Recall 1*	*In social judgement*	*At Recall 2*
1	A, B	B (old) C (new)	A	A, B
2	B, C	C (old) A (new)	B	B, C
3	C, A	A (old) B (new)	C	C, A

people have experienced such an event before the age of 21, 1 = *not at all likely*, 7 = *extremely likely*) followed by a 7-point ''happened to me'' scale (i.e., whether or not the event had happened to them, 1 = *it definitely did not happen*, 7 = *it definitely did happen*). Evidence for a dissociation was assessed by comparing participants' likelihood ratings (considered implicit memory because they did not require conscious recollection; Barnier, 2002) with their happened to me ratings (considered explicit memory because they required conscious access to the autobiographical episodes; Barnier, 2002) for their own events as well as the relationship and life events.

Procedure

Following informed consent procedures, the experimenter administered a standard hypnotic induction procedure (based on Weitzenhoffer & Hilgard, 1962) and then asked participants to think back to their first romantic relationship and to generate specific autobiographical memories from this period in response to 10 cue phrases (Elicitation). Recall latency for each event was measured from the offset of the cue phrase until participants indicated verbally that they had a relevant memory in mind. The experimenter also asked participants to rate the quality of their memories in terms of valence (''how positive is your memory of this event?''; 1 = *not at all positive*, 7 = *very positive*), overall clarity (''how clear is your memory of the event?''; 1 = *dim*, 7 = *sharp and clear*), and clarity of thoughts and feelings at the time of the event (''to what degree do you remember what you thought and how you felt at the time of the event?''; 1 = *not at all*, 7 = *very clearly*).

The experimenter then administered a number of standard hypnotic suggestions, followed by the PHA suggestion. She told half the participants that after hypnosis they would not be able to recall any memories from their first romantic relationship and they would forget that this relationship had occurred at all (*lifetime suggestion*) and she told half that after hypnosis they would not be able to recall the specific events that they had told the hypnotist about earlier (*specific suggestion*). She told all participants that they would be unable to recall this material until they received a reversibility cue (''Now you can remember everything'').

After a standard hypnotic deinduction procedure (based on Weitzenhoffer & Hilgard, 1962), the experimenter administered the social judgement task, which was presented as a test of information-processing speed following hypnosis. She then asked participants to complete a filler task (category generation) to separate the implicit and explicit tests. Following this, the experimenter administered Recall 1. She presented participants with 10 cue phrases and asked them to recall specific autobiographical memories from their first romantic relationship related to each cue phrase. She indicated that some cue phrases would be ones they were presented with at Elicitation (old cues; n = 5) and some would be different (new cues; n = 5). She indicated that if the cue phrase was the same, they should recall the memory they had given during Elicitation; if they could not recall the memory, they could tell the experimenter about a different event. As at Elicitation, recall latency for each event was measured from the offset of the cue phrase until participants indicated verbally that they had a relevant memory in mind. Also, participants rated their memories in terms of valence, overall clarity, and

clarity of thoughts and feelings on 7-point Likert scales.

The experimenter then gave the reversibility cue that cancelled PHA, and administered Recall 2. She presented participants with the 10 cue phrases used during Elicitation and asked them to recall the specific autobiographical memories from their first romantic relationship that they had originally given in response to these cues. She also asked participants to rate their memories in terms of valence, overall clarity, and clarity of thoughts and feelings on 7-point Likert scales. Finally, she answered any questions, thanked participants, and ended the session.

Across the recall tests, autobiographical memories were scored in terms of whether participants generated a unique, specific memory with an identifiable beginning and end in response to the cue phrases (consistent with the definition of event-specific knowledge, Conway & Pleydell-Pearce, 2000). At Recall 1, participants' responses were further coded in terms of whether the memories were the same as at Elicitation (the majority of details were the same), a new, different memory (the majority of details were different), or no memory (no memory was generated). At Recall 2, participants' responses were further coded in terms of whether the memories were the same as at Elicitation, the same as at Recall 1 (for instances where different memories were generated across Elicitation and Recall 1), or no memory.

RESULTS

Cued recall performance before, during, and after PHA

Analysis focused first on participants' explicit memory of the autobiographical events at Elicitation (i.e., before PHA). Table 2 presents the mean number of memories recalled, mean recall latency, and mean quality ratings for memories at Elicitation. A 2 (hypnotisability: high/low) × 2 (suggestion version: lifetime/specific) analysis of variance (ANOVA) of the number of memories recalled yielded a main effect of hypnotisability, $F(1, 44) = 4.11$, $p < .05$; all other main and interaction effects were nonsignificant. Highs gener-

TABLE 2
Mean number of memories recalled, mean recall latency, and mean quality ratings for memories at elicitation

	Memory performance	
Hypnotisability and suggestion version	*Number of memories*	*Recall latency*
High		
Lifetime	9.33 (1.37)	4.17 (3.39)
Specific	8.83 (1.59)	5.01 (2.02)
Low		
Lifetime	7.92 (1.78)	5.17 (2.30)
Specific	8.33 (1.78)	6.39 (2.83)

	Memory quality		
	Valence	*Overall clarity*	*Clarity of thoughts & feelings*
High			
Lifetime	4.87 (0.68)	4.86 (0.76)	4.50 (0.97)
Specific	4.36 (0.93)	4.77 (1.00)	5.01 (0.97)
Low			
Lifetime	4.76 (0.91)	4.81 (0.90)	4.66 (0.91)
Specific	4.66 (0.74)	4.42 (1.07)	4.26 (0.78)

For memories, maximum = 10. Recall latency is in secs. For valence rating, 1 = *not at all positive*, 7 = *very positive*; for overall clarity rating, 1 = *dim*, 7 = *sharp and clear*; for clarity of thoughts and feelings rating, 1 = *not at all*, 7 = *very clearly*. Standard deviations appear in parentheses.

ated slightly more memories than lows. Separate 2 (hypnotisability) × 2 (suggestion version) ANOVAs of mean recall latency, valence ratings, overall clarity ratings, and clarity of thoughts and feelings ratings yielded no significant main or interaction effects. Thus, prior to the administration of the PHA suggestion, participants recalled memories in response to the majority of the cue phrases and those memories were similar in terms of recall latency and qualitative characteristics.

Analysis focused next on participants' performance at Recall 1 (i.e., after PHA was suggested); specifically, the number of memories recalled, recall latency, and quality ratings for memories in response to old cues (i.e., the five cue phrases presented during Elicitation) and new cues (i.e., the five cue phrases not previously presented). Table 3 summarises these data. A 2 (hypnotisability: high/low) × 2 (suggestion version: lifetime/specific) × (2) (cue type: old/new) mixed model ANOVA of memories recalled yielded an interaction between hypnotisability and cue type, $F(1, 44) = 4.59$, $p < .05$; all other main and interaction effects were nonsignificant. Post hoc Scheffe comparisons ($p < .05/2$) confirmed that whereas highs ($M = 4.29$, $SD = 0.95$) and lows ($M = 4.21$, $SD = 0.93$) recalled a similar number of memories to old cues, highs ($M = 4.54$, $SD = 0.59$) recalled more memories than lows ($M = 3.92$, $SD = 1.14$) to new cues.

TABLE 3
Mean number of memories, mean recall latency, and mean quality ratings (for highs) for memories to old and new cues at Recall 1

Hypnotisability and suggestion version	*Old cues*	*New cues*
Number of memories		
High		
Lifetime	4.33 (1.07)	4.42 (0.51)
Specific	4.25 (0.87)	4.67 (0.65)
Low		
Lifetime	4.00 (1.04)	3.50 (1.31)
Specific	4.42 (0.79)	4.33 (0.78)
Recall latency		
High		
Lifetime	5.83 (3.45)	4.66 (2.41)
Specific	3.34 (2.69)	5.41 (3.81)
Low		
Lifetime	2.45 (1.27)	6.09 (3.80)
Specific	4.59 (3.84)	5.24 (2.65)
Valence (highs)		
Lifetime	4.85 (1.03)	5.14 (1.30)
Specific	4.76 (1.30)	4.92 (1.16)
Overall clarity (highs)		
Lifetime	4.17 (1.01)	4.61 (1.17)
Specific	5.02 (1.12)	4.86 (1.25)
Clarity thoughts/feelings (highs)		
Lifetime	3.91 (0.97)	4.21 (1.05)
Specific	4.97 (1.38)	4.68 (1.16)

For memories, maximum = 10. Recall latency is in secs. For valence ratings, 1 = *not at all positive*, 7 = *very positive*; for overall clarity ratings, 1 = *dim*, 7 = *sharp and clear*; for clarity of thoughts and feelings ratings, 1 = *not at all*, 7 = *very clearly*. Standard deviations appear in parentheses.

Although participants recalled memories in response to the majority of old cues on this test, their memories were not necessarily the same as those at Elicitation. Participants were told that for old cues they should recall the memory they had given at Elicitation if they could remember it, or if they could not, a different event. In other words, participants could recall the same memory, a new/different memory, or no memory at all. A 2 (hypnotisability) × 2 (suggestion version) ANOVA of the number of *same* memories recalled in response to old cues (as a proportion of total memories for these cues) yielded a main effect of hypnotisability, $F(1, 44) = 13.24$, $p < .001$, and an interaction between hypnotisability and suggestion version, $F(1, 44) = 4.26$, $p < .05$; the suggestion version main effect was nonsignificant. Of the memories recalled by lows at Recall 1, 90% were the same as Elicitation; in contrast, only 54% of the memories recalled by highs were the same. Most importantly, suggestion version influenced highs', but not lows', pattern of recall to old cues. Whereas 70% of the memories recalled by highs given the specific suggestion were the same as Elicitation, only 38% of the memories recalled by highs given the lifetime suggestion were the same. Thus, when presented with old cues, highs given the lifetime suggestion recalled fewer previously elicited memories.

A 2 (hypnotisability) × 2 (suggestion version) × (2) (cue type) mixed model ANOVA of recall latency for memories in response to old and new cues at Recall 1 yielded a main effect of cue type, $F(1, 43) = 6.64$, $p < .015$, and an interaction among hypnotisability, suggestion version, and cue type, $F(1, 43) = 9.33$, $p < .005$; all other main and interaction effects were nonsignificant. Both highs and lows showed interactions between suggestion version and cue type, $F(1, 21) = 4.82$, $p < .05$ and $F(1, 22) = 4.48$, $p < .05$, respectively. However, these effects were in opposite directions. For highs, whereas for old cues those given the lifetime suggestion responded somewhat more slowly

than those given the specific suggestion, there was no difference in their response speed for new cues (see Table 3). For lows, whereas for old cues those given the lifetime suggestion responded somewhat faster than those given the specific suggestion, there was no difference in their response speed for new cues (see Table 3). Thus, when presented with old cues, highs given the lifetime suggestion not only recalled fewer previously elicited memories, but took longer to respond with the memories they did recall, which were mostly new.

The impact of suggestion version on the memory performance of highs given the lifetime suggestion can also be seen in their ratings of memory quality (see Table 3). A series of two-tailed *t*-tests indicated that highs given the lifetime suggestion rated their memories to old cues (two thirds of which were new) as less clear (both in terms of overall clarity and clarity of thoughts and feelings) than highs given the specific suggestion (and who mostly recalled the same memories as Elicitation), $t(21) = 1.92$, $p < .07$ and $t(21) = 2.14$, $p < .05$, respectively. All other ratings (valence of memories to old and new cues, clarity of memories to new cues) did not differ.

Analysis focused finally on participants' cued recall performance at Recall 2. A 2 (hypnotisability) × 2 (suggestion version) ANOVA of the number of memories recalled yielded no significant main or interaction effects. Following the reversibility cue, participants overwhelmingly recalled the same events that they had generated during Elicitation. Specifically, of the total memories recalled to the 10 cues at Recall 2, 92% of highs' memories and 96 of lows' memories were the same. Thus, following cancellation of PHA, highs' recall in particular (especially those given the lifetime suggestion) returned to Elicitation level.

Dissociations between implicit and explicit memory

Table 4 presents the mean likelihood and happened to me ratings for life events (taken from the Life Events Inventory), relationship events (common relationship events generated by pilot participants), and personal events (descriptions of participants' own memories generated during Elicitation) by highs and lows according to suggestion version. A 2 (hypnotisability: high/low) × 2 (suggestion version: lifetime/specific) × (3) (event: life/relationship/personal) mixed model ANOVA of likelihood ratings yielded only a main effect of event, $F(2, 88) = 103.21$, $p < .001$; all other main and interaction effects were nonsignificant. Post hoc Scheffe comparisons ($p < .05/3$) confirmed that participants rated the relationship events ($M = 5.17$, $SD = 0.53$) and their own personal events ($M = 4.90$, $SD = 1.20$) as more likely than the life events ($M = 3.18$, $SD = 0.65$).

TABLE 4
Mean likelihood and happened to me ratings for life, relationship, and personal events on social judgement task

Hypnotisability and suggestion version	*Life events*	*Relationship events*	*Personal events*
Likelihood			
High			
Lifetime	3.38 (0.84)	5.32 (0.56)	5.15 (1.33)
Specific	3.17 (0.62)	5.20 (0.53)	4.93 (1.18)
Low			
Lifetime	3.11 (0.44)	5.27 (0.53)	5.19 (0.91)
Specific	3.07 (0.68)	4.99 (0.45)	4.32 (1.26)
Happened to me			
High			
Lifetime	3.07 (1.03)	4.40 (1.38)	4.80 (1.97)
Specific	3.05 (0.89)	3.90 (0.77)	5.70 (1.84)
Low			
Lifetime	2.62 (0.46)	4.43 (1.74)	6.87 (0.30)
Specific	2.63 (0.46)	4.32 (1.27)	6.67 (0.57)

For likelihood ratings, 1 = *not at all likely*, 7 = *extremely likely*; for happened to me ratings, 1 = *it definitely did not happen*, 7 = *it definitely did happen*. Standard deviations appear in parentheses.

Importantly, highs' and lows' ratings for their own personal events were similar. A 2 (hypnotisability) × 2 (suggestion version) × (3) (event) mixed model ANOVA of happened to me ratings yielded main effects of hypnotisability, $F(1, 44) = 4.18$, $p < .05$, and event, $F(2, 88) = 91.56$, $p < .001$, and an interaction between hypnotisability and event, $F(2, 88) = 8.98$, $p < .001$. Post hoc Scheffe comparisons ($p < .05/3$) confirmed that participants' happened to me ratings were higher for their personal events ($M = 6.01$, $SD = 1.59$) than the relationship events ($M = 4.26$, $SD = 1.31$), which in turn were higher than the life events ($M = 2.84$, $SD = 0.76$). Importantly, however, highs' and lows' ratings for their personal events were different, $t(46) = 3.76$, $p < .001$. Highs ($M = 5.25$, $SD = 1.92$) gave significantly lower ratings than lows ($M = 6.77$, $SD = 0.47$), indicating that highs were less certain than lows that their personal events had happened to them.[3] For highs, this pattern of similar likelihood ratings, but different happened to me ratings for personal events represents a dissociation between implicit and explicit memory.

DISCUSSION

This experiment investigated the impact of inhibitory processes on personal memory within an innovative paradigm that combined methods from the PHA literature with theoretical predictions from the autobiographical memory literature. Specifically, we examined the impact of suggestion focus on PHA's ability to influence memories of a first romantic relationship. We compared forgetting associated with a suggestion that targeted the entire period of the relationship with a suggestion that targeted only selected events from that period. Overall, we found that following the PHA suggestion highs' recall was impaired in comparison to that of lows; on Recall 1 they were less likely to recall previously elicited memories. Despite this, the ''forgotten'' events influenced their responses on the social judgement task (i.e., highs showed a dissociation between implicit and explicit memory). Finally, following cancellation of the suggestion, highs' recall returned to its Elicitation level. This pattern of impaired explicit memory, spared implicit memory, and reversibility is consistent with previous research involving both relatively simple, nonpersonal material (e.g., word lists; Barnier et al., 2001; Bryant et al., 1999; Kihlstrom, 1980) and autobiographical episodes (Barnier, 2002; Barnier & Wright, 2001). Importantly, it reinforces the conclusion that PHA can influence some (high hypnotisable) individuals' memories of autobiographical events.

Notably, however, the nature of highs' memory impairment was not as clear-cut as has been demonstrated in other research in this programme involving either simple material or entire autobiographical episodes (Barnier, 2002; Barnier et al., 2001; Barnier & Wright, 2001; Bryant et al., 1999). In contrast to previous experiments, we did not find a general impairment in highs' total recall of memories from the period targeted by the suggestion. In fact, on Recall 1 they generated memories in response to the majority of (old and new) cues, if not slightly more than lows. Rather, the pattern of highs' recall (number of memories generated, recall latency, and ratings of memory quality) depended on the focus of the suggestion. Motivated by Conway and Pleydell-Pearce's (2000) hierarchical model of autobiographical memory, we administered two versions of the PHA suggestion: a ''lifetime'' suggestion, which targeted the entire period of their romantic relationship, and a ''specific'' suggestion, which targeted only selected events from the period (generated during Elicitation).

Highs given the lifetime suggestion showed significant forgetting of the memories generated at Elicitation. On Recall 1, in response to ''old'' cues (cue phrases used at Elicitation) these highs were less likely to recall previously elicited memories and took longer to respond with the memories that they did recall, which were mostly ''new'' (i.e., not generated at Elicitation). They also rated their new memories to old cues as less clear than highs given the specific suggestion. In other words, the lifetime suggestion limited the accessibility of previously elicited memories, as well as influencing the accessibility and quality of new memories from the targeted period (for a discussion of PHA's impact on accessibility vs quality, see Barnier & Wright, 2001). Importantly, however, highs given the lifetime suggestion had no difficulty in recalling new memories from the targeted period in response to new cues (i.e., cue phrases not used at Elicitation). Thus, the lifetime suggestion influenced both previously elicited and

[3] Although the interaction between hypnotisability and suggestion version was not significant for personal events, $F(1, 44) = 1.89$, $p = .18$, highs given the lifetime suggestion (who were the only group to show significant forgetting of their Elicitation memories on Recall 1) had the lowest mean ''happened to me'' rating (see Table 4).

not previously elicited (but related) memories from the targeted period *only* when those memories were associated with the cue phrases used at Elicitation.

In contrast, highs given the specific version of the suggestion showed little forgetting of the events from Elicitation or other, related events. On Recall 1, in response to old cues these highs recalled mostly previously elicited memories. They recalled these memories more quickly and rated them as more clear than highs given the lifetime suggestion. Also, they had no difficulty in recalling new memories from the relationship period in response to new cues. Thus, the specific suggestion had no influence on previously elicited memories targeted by the suggestion or not previously elicited (i.e., nontargeted) memories from the relationship period.

These findings are important because they are consistent, in part, with Conway and Pleydell-Pearce's (2000) model of autobiographical memory. Based on their discussion of inhibitory processes in personal memory, we proposed that a PHA suggestion that targets the top level of the autobiographical knowledge hierarchy (i.e., a lifetime period) would be more successful than a specific suggestion that targets knowledge further down the hierarchy (i.e., specific knowledge or events) because it defines or tags all related memories in terms of the goal to forget, thus minimising potential retrieval cues for to-be-forgotten information. The lifetime suggestion *was* more successful than the specific suggestion—it led to more forgetting of previously elicited events. But to what extent was this due to a ''diffusion'' of PHA's effect from targeted to nontargeted (but related) events and/or to the presence or absence of strong retrieval cues (in the form of nontargeted events)?

In terms of PHA's impact on targeted and nontargeted events, highs given the lifetime suggestion recalled fewer previously elicited memories, and took longer to recall and rated as less clear previously unelicited (but related) memories from the targeted period. This finding suggests that the effect of PHA (or indeed any method of inhibition) may ''diffuse'' across memories linked in the autobiographical knowledge base. However, this was only the case for memories generated in response to old cues. These highs had no difficulty in recalling relationship memories to new cues. This implies that the impact of PHA on related memories depends on an association among the suggestion, particular memories, and the cue phrases, and not just sets of memories. That is, the cue phrases must also become defined or tagged in terms of the goal to forget, even though they were not specifically targeted by the suggestion.

In terms of nontargeted events acting as retrieval cues, highs given the specific suggestion recalled both their previously elicited memories to old cues and new memories to new cues. Thus, PHA's effect did not ''diffuse'' from targeted to nontargeted events, but rather the nontargeted events acted as retrieval cues for the targeted events and limited forgetting. In contrast, highs given the lifetime suggestion maintained forgetting of their previously elicited memories (to old cues) despite recalling new, related memories for both old and new cues. That is, the recalled events did not breach their forgetting of unrecalled events (for a review of breaching of PHA, see Coe, 1996). Such discrepancies across the suggestions may be due to a balance between the number and nature of memories associated with a goal to forget and the number and nature of memories not related to that goal.

There may be other reasons why the lifetime suggestion influenced some, but not all, memories from the targeted period, and the specific suggestion did not influence participants' memories at all. One possibility is the nature of the memories on which we focused. We expected that the lifetime suggestion would create a broad sweeping memory loss, at least for the targeted period of participants' first romantic relationship (for functional amnesia cases involving similar memory loss, see Schacter, 1996). On Recall 1, we expected highs given the lifetime suggestion to have little or no recall of previously elicited and not previously elicited memories in response to old and new cues. But this was not the case. Conway and Pleydell-Pearce (2000) suggested that ''first time'' memories are particularly memorable (see also Robinson, 1992). The period of a first romantic relationship may contain a number of such memories (e.g., first date, first time holding hands, first kiss). Also, as participants were relatively young (first-year university students), their first romantic relationship may have been a current period with strong links to current self-identity (see also Neimeyer & Metzler, 1994). Forgetting memories from this period may have conflicted with a goal of the working self that was more important or more salient than the goal of experiencing PHA.

The relatively focused impact of the lifetime and specific suggestions (in comparison to

previous PHA research; Barnier, 2002; Bryant et al., 1999; Kihlstrom, 1980) may be due to the way in which we indexed forgetting. Although one version of the suggestion targeted the lifetime level, we only tested memory at the level of specific events (i.e., previously elicited memories to old cues). We may have found a more general recall deficit if we had asked participants to report everything they could remember from the relationship period. Also, we tested PHA with cued rather than free recall. Although cued recall provides more information to aid retrieval, and thus increases memory performance, it was appropriate for Recall 1 and 2 because Elicitation involved cued recall (Barnier et al., 2001; Tulving, 1974). The findings of our single experiment should be interpreted in light of these issues, and await (as well as hopefully generating) research that replicates the current results and resolves these questions.

Laying these issues aside, an essential finding of this experiment is that PHA generates a pattern of memory performance similar to functional amnesia. A PHA suggestion administered to highly hypnotisable individuals can temporarily disrupt their explicit, but not implicit, memory for autobiographical events. As importantly, the pattern of memory inhibition may be quite selective. Future work could explore whether PHA can reliably inhibit the accessibility of an entire period (whether temporally or thematically defined), an entire life history, or even an individual's identity, as seen in the most dramatic cases of functional amnesia (Kihlstrom & Schacter, 1995; Schacter, 1996). Consistent with other research on experimentally induced (e.g., Wegner, Quillian, & Houston, 1996) and clinically relevant (e.g., Koss, Figueredo, Bell, Tharan, & Tromp, 1996) forgetting, the impact of PHA on autobiographical memory is both complex and multi-faceted, particularly in terms of the accessibility and quality of memories (see also Barnier, 2002; Barnier, Wright, & McConkey, in press).

The present work is of both intrinsic and instrumental interest (Barnier & McConkey, 1999; Reyher, 1962). In terms of intrinsic interest, it highlights the benefits of conceptualising PHA's effect within current models of autobiographical memory. As research moves beyond simple word-list stimuli, accounts of PHA should specify how complex and personally relevant information is represented and organised, the motivational or goal-directed influences on its retrieval, and the nature of executive control processes (inhibitory or otherwise) that create particular patterns of suggested forgetting. In terms of instrumental interest, this work reinforces the value of PHA as both a means of testing predictions about inhibitory processes in personal memory and as a laboratory analogue of clinical memory disorders. Whereas our use of PHA in this way is innovative, it owes much to decades of hypnosis research, and is just one example of how hypnotic techniques can contribute to our understanding of not only memory, but psychological processes in general.

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