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Hypnosis as a Retrieval Cue in Posthypnotic Amnesia

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The effectiveness of hypnosis as a retrieval cue was tested in a group of 80 highly hypnotizable subjects who demonstrated posthypnotic amnesia on an initial recall test. The 40 subjects who received a reinduction of hypnosis showed a significant improvement in memory on a retest; there was a significant loss of memory on a third test following termination of the second hypnosis and a more substantial recovery on a fourth test following administration of a prearranged reversibility cue. Another 40 subjects, who merely relaxed before the second test, showed a similar improvement in memory on the retest but no subsequent memory loss. The amount of trial-to-trial improvement in memory shown by the subjects was unaffected by explicit instructions to maintain amnesia until the reversibility cue had been given. Posthypnotic amnesia is not a case of state-dependent retention, nor does hypnosis provide retrieval cues that can lead to the emergence of previously unrecalled memories.

Upon termination of hypnosis, many hypnotizable subjects find it difficult to remember the events and experiences that transpired while they were hypnotized. The amnesia occurs only as a result of suggestion, and memory for these experiences is restored following administration of a reversibility cue arranged at the time that the suggestion is offered by the hypnotist. The phenomenon of reversibility marks posthypnotic amnesia as a disruption of memory retrieval, rather than of encoding or storage, in such a way that available memories are temporarily rendered inaccessible.

These observations are largely noncontroversial, but there is considerable theoretical disagreement with respect to the processes underlying the amnesia phenomenon (Hilgard, 1966; Kihlstrom, 1977, 1985). One way of approaching the question of mechanism is to find ways of restoring access to the forgotten memories without administering the reversibility cue. For example, response to amnesia suggestions is typically tested by the method of free recall, as in the Stanford Hypnotic Susceptibility Scales (Cooper, 1979). According to most theoretical analyses of memory retrieval, free recall provides relatively little cue information to the subject. Thus, retrieval should be improved by cued-recall or recognition procedures, which provide more informative retrieval cues and thus facilitate access to the material covered by the amnesia. In fact, subjects typically display less amnesia when tested by recognition as opposed to free-recall procedures (Barber & Calverley, 1966; Kihlstrom & Shor, 1978; St. Jean & Coe, 1981; Williamsen, Johnson, & Eriksen, 1965), although the amnesia is not always thereby abolished, especially among the most highly hypnotizable subjects. Such experiments support the notion that posthypnotic amnesia reflects a disruption in memory retrieval processes (Kihlstrom, 1985; Kihlstrom & Evans, 1979).

A second line of investigation involves varying the situational demands of the amnesia test procedure in an effort to breach the amnesia. In one experiment, for example,

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subjects were tested twice while the amnesia suggestion was in effect. The first test was a standard test of free recall. For the second test, subjects received instructions for extra effort in recall, honesty in reporting, or serial organization; a control group received a simple retest, without any other instructions. Subjects of moderate to high hypnotizability in all conditions showed equivalent increases in recall from the first test to the second (Kihlstrom, Evans, Orne, & Orne, 1980). Subsequent research, however, indicated that insertion of a putative lie detector or strong honesty demands does result in an increase in recall, compared with control subjects' recall, for hypnotizable, amnesic subjects who reported that their memory reports were under voluntary control. No differential effect was observed for subjects who reported that their amnesia occurred involuntarily (Howard & Coe, 1980; Schuyler & Coe, 1981). These results suggest that for some (but not all) subjects, posthypnotic amnesia reflects a voluntary suppression of memory reports rather than a failure of memory retrieval (Coe, 1978; Spanos & Radtke-Bodorik, 1980).

In light of these analyses, it is interesting to recall the assertions of early authorities on hypnosis that posthypnotic amnesia occurs spontaneously after the termination of hypnosis and persists until hypnosis is reinduced (for a review, see Bramwell, 1913). In these terms, then, posthypnotic amnesia appears to have been construed as a form of state-dependent retrieval. This phenomenon was originally documented in nonhuman animals (Overton, 1968) and has been observed in human subjects following the administration of a variety of centrally acting drugs (for reviews, see Eich, 1977, 1980), as well as following shifts in emotional mood (Bower, 1981) and sleep state (Evans, 1979). In addition, an analogous effect has been observed following shifts in environmental context (e.g., Smith, Glenberg, & Bjork, 1978). In all these cases, the memorability of an event is controlled by the congruence between the organismic state or context in which the memory was encoded and that in which retrieval is attempted. From a theoretical point of view, state-dependent retrieval reflects the encoding specificity principle (Tulving & Thomson, 1973), which states that the accessibility of a memory is determined by the degree of similarity between the features of the event encoded at the time it occurred and the cue information supplied by the retrieval query.

Modern research, however, casts doubt on the status of posthypnotic amnesia as an instance of state-dependent retrieval (SDR). For example, amnesia is rarely observed unless it is explicitly suggested (Hilgard & Cooper, 1965), and suggested amnesia can be reversed by the administration of a prearranged reversibility cue, without the reinduction of hypnosis (Kihlstrom & Evans, 1976; Nace, Orne, & Hammer, 1974). The few cases of apparently spontaneous or nonreversible amnesia appear to represent the effects of expectation or subtle suggestion (Young & Cooper, 1972), extremes of the distribution of normal forgetting (Cooper, 1979), or some other form of pseudoamnesia (Kihlstrom & Evans, 1976). Moreover, suggested amnesia can be observed even before hypnosis has been terminated (e.g., Spanos & Bodorik, 1977).

For these reasons, posthypnotic amnesia does not fit the classic pattern of SDR. Nevertheless, the encoding specificity principle implies that the reinduction of hypnosis, without administration of the reversibility cue, may permit recovery of memories that have been forgotten as a result of the amnesia suggestion. Whatever changes in mental or physiological state are experienced by a hypnotized subject necessarily constitute features of the organismic context in which hypnotic events take place and may be encoded along with representations of these events. Accordingly, reinstatement of the hypnotic context may provide retrieval cues that are missing when the subject is queried in the normal waking state. This enhanced congruence between encoding and retrieval conditions, in turn, might enhance recall. The purpose of this experiment was to explore the possibility that hypnosis could serve as a retrieval cue that would be effective in breaching posthypnotic amnesia.

Method

Although the present experiment was largely inspired by the literature on SDR and the encoding specificity principle, the phenomenon of amnesia is not itself an instance of SDR. Therefore, the classic 2 × 2 design for

SDR experiments—in which the presence of some organismic state is varied orthogonally at both encoding and retrieval—was deemed inappropriate. Instead, posthypnotic amnesia was induced as usual by means of a suggestion that included a reversibility cue. After testing the subject's initial level of response to the suggestion, hypnosis was reinduced and memory was retested. Memory was assessed for a third time following the termination of the second hypnosis and for a final time after administration of the prearranged reversibility cue. In strict terms, only the first three tests are relevant to the question of whether hypnosis can serve as a retrieval cue. However, the final test permitted assessment of the strength of the hypnosis cues compared with that of the reversibility cue.

In addition to these repeated tests, the experimental design included two between-subjects manipulations. For one, half of the subjects were in a relaxed state instead of being rehypnotized. This served as an elementary control for the passage of time between tests and the relaxation that occurs as a byproduct of the specific hypnotic induction that was used (Edmonston, 1981). For the other, half of the subjects received a modified form of the amnesia suggestion reminding the subject that the amnesia suggestion was to remain in effect until the reversibility cue was formally given. This permitted assessment of the extent to which the reinduction procedure was interpreted by the subjects as a subtle reversibility cue.

Subjects

From a large pool of college students who received the Harvard Group Scale of Hypnotic Susceptibility, all subjects who scored 10–12 on that 12-point scale were invited to return to the laboratory for an individual administration of the Stanford Hypnotic Susceptibility Scale, Form C (SHSS:C). The SHSS:C consists of an induction of hypnosis accompanied by a series of suggestions for 12 representative hypnotic experiences (for details, see Hilgard, 1965). Hypnotizability is assessed in terms of the number of items passed according to dichotomous behavioral criteria. The last item on the SHSS:C is a suggestion of posthypnotic amnesia for the other 11 test suggestions and the establishment of a cue to reverse the amnesia. Amnesia is defined in terms of the number of these items remembered posthypnotically. In the standard form of the scale, two memory tests are conducted after termination of hypnosis. According to the standardized scoring criterion, those subjects who recall no more than 3 of the 11 critical items on the first test are considered to pass the criterion for amnesia. On the second test, which follows the administration of the reversibility cue, the subject is asked to recall any additional items not remembered previously. This test does not usually enter into the scoring of the amnesia item (Kihlstrom & Register, 1984). The scale does not include an assessment of baseline levels of recall, that is, recall level before the amnesia suggestion is given. However, an estimate of total available memory is provided when the reversibility test is modified to require the subject to report all items remembered, regardless of whether they had been reported on the previous test.

Only subjects who met a dual criterion of high hypnotizability (scoring 8–12 on the 12-point SHSS:C) and initial posthypnotic amnesia (recalling 0–3 items on the initial memory test) were retained for the experiment. Out of 211 subjects who received the SHSS:C, 134 met the criterion of high hypnotizability; data collection was discontinued as soon as 80 of these met the criterion of initial posthypnotic amnesia. These 80 subjects were randomly assigned to one of four conditions in a 2 × 2 design, until 20 subjects had been run in each cell. For the remaining 131 subjects, the SHSS:C was terminated normally (data for these subjects do not appear in the present report). Thus, the subjects retained for the experiment constitute a consecutive sample of highly hypnotizable, initially amnesic subjects. In return for their participation, all subjects received either credit toward the research participation option of their introductory psychology course or $4 for each of the two sessions.

Procedure

Only those portions of the SHSS:C that concerned the amnesia suggestion and test were altered for this experiment. Assignment of subjects to conditions was carried out in two stages: before administration of the suggestion and after the initial test of posthypnotic amnesia. The experimenter was blind to the suggestion condition throughout the first 11 items of the scale; similarly, the experimenter was blind to the testing condition until after the first amnesia test had been completed.

Amnesia Suggestion

After completing the first 11 items of the scale, subjects who had passed at least 8 items were asked to rate their hypnotic "depth" on an open-ended scale in which 0 was defined as *wide awake;* 4 to 5, as *moderate state of hypnosis;* and 10, as *very deep state of hypnosis.* This constituted Depth Rating 1. Then each subject was randomly assigned to one of two conditions for the amnesia suggestion.

Standard condition. Half of the subjects received the standard form of the SHSS:C amnesia suggestion:

> In a little while I shall begin counting backward from 20 to 1. You will awaken gradually, but you will still be in your present state for most of the count. . . . When I get to 1 you will be entirely roused up, in your normal state of wakefulness. You will have been so relaxed, however, that you will have trouble recalling the things I said to you and the things you did or experienced. It will prove to cost so much effort to recall that you will prefer not to try. It will be much easier just to forget everything until I tell you that you can remember. You will forget all that has happened until I say to you, "Now you can remember everything." You will not remember anything until then.

Explicit condition. The remaining subjects received a modified version of the suggestion, stressing that the amnesia was to remain in effect until the experimenter explicitly gave the reversibility cue (changed portions of the suggestion appear in italics):

> When I get to 1 you will be entirely roused up, in your normal state of wakefulness. You will have been so relaxed, however, that you will have trouble recalling

Table 1
HGSHS:A and SHSS:C Sample Parameters for Conditions

Variable	Standard suggestion		Explicit suggestion	
	Reinduction	Relaxation	Reinduction	Relaxation
HGSHS:A score				
M	10.70	10.65	10.45	10.85
SD	1.03	1.09	1.00	0.81
SHSS:C score				
M	10.85	10.20	10.30	10.60
SD	0.93	0.83	1.03	1.05
Initial depth rating[a]				
M	7.03	6.96	7.54	7.07
SD	2.17	2.11	1.55	1.69
Initial amnesia response[b]				
M	1.25	1.50	1.35	0.80
SD	1.21	1.28	0.88	1.11

Note. *n*s for all four conditions = 20. HGSHS:A = Harvard Group Scale of Hypnotic Susceptibility, Form A; SHSS: C = Stanford Hypnotic Susceptibility Scale, Form C.
[a] 0–10 (+) rating at Depth 1. [b] Number of items recalled on Test 1.

the things I said to you and the things you did or experienced. *From that time on, until I specifically tell you otherwise,* it will prove to cost so much effort to recall that you will prefer not to try. It will be much easier just to forget everything until I tell you that you can remember. You will forget all that has happened until I *specifically* say to you, "Now you can remember everything." You will not remember anything until *I say these words.*

Memory Test Sequence

All subjects received the identical test of initial amnesia: "Please tell me now in your own words everything that happened since you first began looking at the target." Free recall continued until the subject indicated that he or she remembered nothing more. At this point, the experimenter inquired whether there was anything else that the subject could remember; this cycle continued until the subject explicitly answered in the negative. This trial constituted Test 1. For subjects who met the joint selection criteria, the reversibility test was deferred and the subjects were randomly assigned to one of two sequences of further memory tests.

Reinduction condition. After completing the initial amnesia test, half of the subjects were administered a brief (3-min) hypnotic induction patterned after that of the SHSS:C. Following a 1–10 count, the subjects were asked to report on their hypnotic depth, using the scale established earlier, to insure that hypnosis had been reinduced. All subjects reported a depth of at least 4 on the 10-point rating scale described above, indicating at least a moderate state of hypnosis. This constituted Depth Rating 2. Then the following sequence ensued: free recall test (Test 2); second termination of hypnosis, with no further mention of the amnesia suggestion (1 min); free recall test (Test 3); administration of the reversibility cue; and a final free recall test (Test 4). On each recall test the subjects were instructed to report all items remembered, regardless of whether they had been reported earlier; testing continued until the subjects reached an impasse. The subjects' eyes were closed during the reinduction, Test 2, and termination of hypnosis.

Relaxation condition. The remaining subjects received the same sequence of memory tests, with the exception that nonhypnotic relaxation instructions were substituted for the reinduction and termination procedures, and the subjects were explicitly instructed not to reenter hypnosis. The subjects' eyes were closed during both relaxation periods and during Test 2.

Results

Table 1 displays the sample characteristics for the four treatment groups. A 2 × 2 factorial analysis of variance (ANOVA) with two between-subjects factors (standard vs. explicit suggestion and reinduction vs. relaxation) revealed a significant interaction on SHSS:C score, $F(1, 76) = 4.85$, $p < .05$. There were no significant main effects or interactions on any of the remaining variables. Because the experimenters were totally blind to the condition of the subjects during the administration of the first 11 items, and because the selection procedure insured that all subjects passed the 12th (amnesia) item, this group difference must reflect the operation of chance factors.

Effects of Reinduction on Memory

Figure 1 presents the average number of items recalled, out of a total of 11, on each

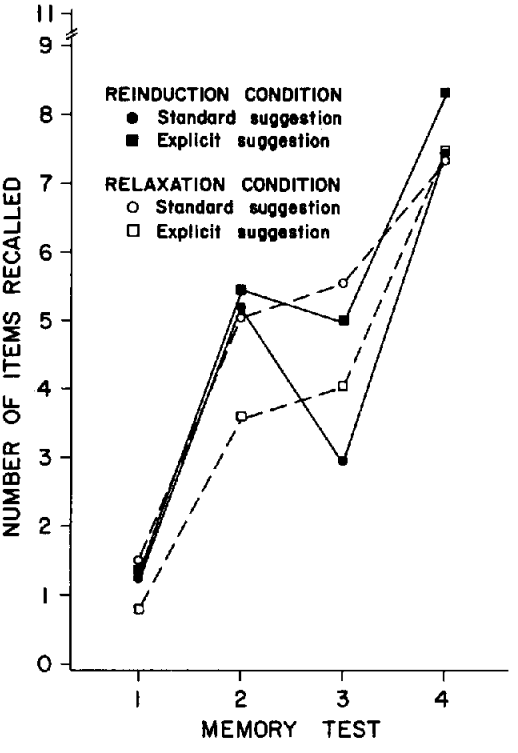

Figure 1. Number of items recalled on four tests of posthypnotic recall in each of the four treatment groups (maximum possible recall = 11).

of the four memory tests by subjects in the four treatment groups. A 2 × 2 × 4 mixed-design ANOVA with two between-subjects factors (suggestion and reinduction) and one within-subjects factor (recall tests) showed, as expected, a significant main effect of trials, $F(3, 228) = 131.38$, $p < .001$. There was also a significant interaction between suggestion and reinduction, $F(1, 76) = 5.09$, $p < 05$, and another significant interaction between reinduction and trials, $F(3, 228) = 2.79$, $p < .05$. No other main effects or interactions were significant. The interaction between suggestion and reinduction reflects the low overall level of recall in the group that received the explicit amnesia suggestion followed by relaxation instead of reinduction. When the data for Tests 2–4 were submitted to a 2 × 2 × 3 mixed-design analysis of covariance (ANCOVA) with two between-subjects factors (suggestion and reinduction) and one within-subjects factor (recall tests), with recall on Test 1 entered as a covariate, this interaction disappeared. However, the main effect of trials and the significant interaction between reinduction and trials was confirmed, and no other effects were significant. Thus, the reinduction procedure affected trial-to-trial recall, but the type of amnesia suggestion given to subjects had no influence on these changes.

Viewed in isolation, the pattern of recall shown by the reinduction subjects is similar to that seen in state-dependent retrieval: Memories were recovered when hypnosis was reinduced and forgotten again when it was terminated. However, comparisons of adjoining pairs of tests showed that state dependency was not really involved. A 2 × 2 × 2 mixed-design ANOVA applied only to Tests 1 and 2 revealed a significant effect of trials, $F(1, 76) = 101.42$, $p < .001$, but no other significant main effects or interactions. Thus, the reinduction and relaxation groups showed equivalent increments in recall across these two tests. A similar ANCOVA applied to Tests 2 and 3 (with Test 1 as a covariate) revealed a significant interaction of reinduction with trials, $F(1, 76) = 8.60$, $p < .005$, but no other significant main effects or interactions. On Test 3, recall increased further for those who received the relaxation instruction but decreased for those who had received the reinduction of hypnosis. All groups showed equivalent levels of memory on the final recall test, after administration of the reversibility cue.

Confirming the Reinduction of Hypnosis

For the subjects receiving the reinduction procedure, a depth rating was taken just prior to Test 2 as a kind of manipulation check to insure that hypnosis had been successfully reinduced. Owing to experimenter error, this rating was not recorded for one subject. A 2 × 2 mixed-design ANOVA with one between-subjects factor (suggestion) and one within-subjects factor (repeated depth ratings) applied to the depth ratings of the 39 subjects in the reinduction groups showed a significant main effect of trials, $F(1, 37) = 12.48$, $p < .005$, but no effect of suggestion and no interaction. The second depth rating was slightly (but significantly) lower than the first one (standard suggestion: $M = 6.07$, $SD = 1.95$; explicit suggestion: $M = 7.01$, $SD = 1.99$). However,

hypnosis was successfully reinduced in all subjects. On the second depth rating, 69.2% of the subjects were within 1 point of their first rating; 87.2% were within 2 points.

Because the occurrence of hypnosis-cued retrieval might depend on the degree to which the second hypnotic experience resembled the first, analysis of the two reinduction groups was repeated with the absolute value of the difference between the two depth ratings substituted as a covariate. This had no effect on the outcome of the analyses reported above.

Comparison of Retrieval Cues

The recall tests used in this study provided the subjects in the two reinduction conditions with three different types of retrieval cues: (a) query cues, contained in the instruction "Now please tell me everything that happened since you began looking at the target," which was presented on all four tests; (b) state cues, provided by the reinduction of hypnosis on Test 2; and (c) the reversibility cue, administered immediately prior to Test 4. To compare the effectiveness of these three retrieval cues, the 11 critical items were coded for their recall status (N = not recalled, C = correctly recalled) on each of the three memory tests administered before the reversibility cue. In terms of this coding system, items retrieved by the query cues have the status CCCC, because they should be recalled correctly on every recall trial (with vanishingly few exceptions, items correctly recalled on Test 1 were also recalled on each of the subsequent trials). Those retrieved only by state cues have the status NCNN, and those retrieved only by the reversibility cue have the status NNNC. In addition, items elicited by both state cues and the reversibility cue are coded NCNC.

Table 2 shows the average number of items recalled in each of these categories for the two reinduction groups combined. It should be noted that NCNN and NNNC underestimate the number of items elicited by the state and reversibility cues, inasmuch as NCNC items should be counted in both categories. Accordingly, the table also shows the totals with NCNC items figured in. Similarly, items in the categories CCCC, NCNN, and NCNC may be classified as elicited by implicit retrieval cues that are not readily apparent to an observer, whereas items in the categories NCNC and NNNC were elicited by explicit cues provided by the experimenter. Statistical comparisons, of course, can only be calculated for pure state versus pure reversibility cue conditions (NCNN vs. NNNC). The explicit reversibility cue was significantly more powerful than the implicit state cues, $t(39) = 4.69$, $p < .001$, a conclusion that continues to hold up when, admittedly violating the assumptions of independence, comparisons are made between the combination categories as well.

Table 2
Recall in Response to Different Retrieval Cues

Effective cue	Recall pattern	*M*	*SD*
Pure cues			
Query	CCCC	1.30	1.04
State	NCNN	0.28	0.51
Reversibility	NNNC	2.40	2.69
Combination cues			
All state	NCNN + NCNC	1.95	2.93
All reversibility	NNNC + NCNC	4.08	3.01
All implicit	CCCC + NCNN + NCNC	3.25	2.86
All explicit	NNNC + NCNC	4.08	3.01

Note. C = correctly recalled; N = not recalled.

Discussion

Highly hypnotizable, amnesic subjects who were rehypnotized showed a substantial recovery of previously forgotten memories. Many of these recovered memories were subsequently forgotten upon the subjects' return to the normal waking state. Such a pattern of recall was not observed in subjects who were not rehypnotized after the initial amnesia test. The observed effect apparently cannot be explained by the subjects' interpretation of the induction procedure as a subtle reversibility cue, because the same pattern of recall was observed in those who received a version of the amnesia suggestion that was expressly designed to circumvent such misunderstandings.[1]

[1] Although this experiment was not specifically designed to test hypotheses pertaining to social psychological ac-

At first glance, then, the results of this study appear to provide evidence that hypnosis can serve as a retrieval cue in posthypnotic amnesia. This conclusion, however, is contradicted by the fact that subjects who received only relaxation instructions showed increments on the second test that were comparable to those observed in the reinduction group. Thus, it is unlikely that the increments in memory observed on the second test in the reinduction group resulted from cues supplied by the reinduction of hypnosis per se. Rather, the improvements in both reinduction and relaxation groups probably represent the spontaneous recovery of memories during posthypnotic amnesia. This phenomenon has been observed in other experiments where amnesic subjects have received a series of repeated recall tests (e.g., Kihlstrom et al., 1980; Kihlstrom, Easton, & Shor, 1983).

At the same time, it should be noted that the reinduction and relaxation groups differed considerably in terms of the fate of these recovered memories on the third test. Recall diminished for the reinduction subjects after termination of the second hypnosis but continued to improve for the relaxation subjects even after they were aroused. The forgetting observed in the reinduction group on the third test, after termination of the second hypnosis, poses a puzzle that remains to be solved by future experiments.

The failure of hypnosis alone to serve as a retrieval cue in posthypnotic amnesia does not in itself contradict the general hypothesis that this amnesia reflects a disruption of normal retrieval processes (Kihlstrom, 1985; Kihlstrom & Evans, 1979). The cue value of "neutral" hypnosis (Edmonston, 1981) may simply be very weak. More salient and distinctive mental contexts than those provided by hypnosis alone, specifically suggested to hypnotic subjects during the time of encoding, may serve to effectively breach posthypnotic amnesia even without administering a reversibility cue (e.g., Blum, Graef, Hauenstein, & Passini, 1971; Bower, 1981).

Because context cues of all sorts are only implicit rather than explicit (Eich, 1980), there is likely to be great variability in the degree to which they are processed at the time of encoding (Bower, 1972; Estes, 1959) or, for that matter, in the degree to which they are processed at the time of retrieval. Such variability, at encoding or retrieval or both, will necessarily diminish the possible congruence between encoding and retrieval conditions and therefore limit the impact of such cues on retrieval operations. Such arguments do not apply, for example, to the explicitly provided reversibility cue. This cue is likely to have been well processed at the time of encoding. Thus, its administration prior to a recall test, again under conditions that increase the likelihood that it will be processed, should result in a high degree of encoding–retrieval congruence and, thus, high levels of recall. Although hypnosis does not serve as a retrieval cue in posthypnotic amnesia, the reversibility cue may ultimately be found to operate according to the encoding specificity principle.

counts of posthypnotic amnesia, the failure of the suggestion factor to have significant effects on recall seems inconsistent with the notion that amnesic subjects strategically control their memory reports in accordance with explicit and implicit social demands (e.g., Sarbin & Coe, 1979; Spanos, 1982). By this view, the performance of these subjects on the initial test of amnesia is in general compliance with the demands contained in the amnesia suggestion (although relatively few subjects, in fact, remembered absolutely nothing), just as their high level of performance on the remainder of the scale is in compliance with the demands contained in those suggestions. However, this same suggestion contained another demand, namely, that they should remember nothing until administration of the reversibility cue. Nevertheless, recall generally improved in these initially amnesic subjects across the two subsequent trials, and this was so even for those subjects who were expressly reminded of this second demand.

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