

POSTHYPNOTIC AMNESIA AS DISRUPTED RETRIEVAL¹

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The process of remembering during posthypnotic amnesia was investigated by exploring the organization of recalled material in subjects displaying only partial amnesia. During three standardized hypnosis scales, suggestions of posthypnotic amnesia were administered to 112 subjects. Hypnotizable subjects tended to recall the scale items in random chronological order, compared to the relatively sequential recall of unsusceptible subjects. The difference in temporal sequencing of recall during amnesia indicates that, for the hypnotizable subject, posthypnotic amnesia is characterized primarily by a disruption or disorganization of part of the recall process, leaving other aspects of memory processing relatively unimpaired. These results suggest a resolution of the apparent paradox between the subjective reports of amnesic subjects and the objective evidence that the apparently forgotten memories remain available for other cognitive operations.

Following a suggestion for posthypnotic amnesia, a deeply hypnotized subject may be completely unable to remember the events that occurred during the hypnotic state, reflecting an apparent discontinuity in awareness between hypnosis and waking. In spite of the subject's inability to recall the events, however, accumulated evidence suggests that the hypnotic experiences are still available at some level to interact with other waking processes. This paradox has given rise to a healthy controversy regarding the nature of posthypnotic amnesia (Cooper, 1972; Hilgard, 1965).

Using the compelling subjective reports of subjects as a starting point, many investigators have assumed that posthypnotic amnesia involves a functional ablation of memories similar to that found in forgetting. Most studies of amnesia have been directly influenced by this point of view. These studies have examined the presence or absence of memory traces using traditional memory

paradigms, including recognition, relearning, and retroactive inhibition (Barber, 1969; Hull, 1933; Williamsen, Johnson, & Eriksen, 1965) or physiological responsivity (Stern, Edmiston, Ulett, & Levitsky, 1953). In general, this research has demonstrated that the functional presence of these "forgotten" memories can be documented by various experimental techniques and that they continue to exert an effect on the subject's waking cognition. Thus, there appears to be a contradiction between the subject's assertion that he cannot remember what has happened during hypnosis, and the objective evidence of the dynamic presence of the "lost" memories.

In attempting to reconcile the apparent incompatibility between the subject's subjective report and his performance on objective measures of memory, some investigators have argued that the concept of posthypnotic amnesia has no empirical validity. Rejecting the subject's "testimony" as unreliable, they have subsumed "amnesic" behavior under compliance, role playing, or other social-psychological phenomena (Barber, 1969; Sarbin, & Coe, 1972).

An explanation of posthypnotic amnesia in terms either of simple forgetting or of role playing neglects some aspects of the phenomenon that seem relevant to any understanding of its mechanisms. (a) An essential component of posthypnotic amnesia is reversibility, or the ability to recall previously blocked items after a prearranged cue has been given to lift the amnesia (Nace, Orne, & Hammer, in press; Orne, 1966). If reversibility occurs, then

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the amnesia cannot be seen as a form of forgetting, since the memory traces obviously remain intact. (b) Posthypnotic source amnesia occurs when the subject remembers information learned during hypnosis but cannot recall the context in which the learning occurred (Evans & Thorn, 1966). Simulating subjects do not exhibit source amnesia (Evans, 1971), indicating that it is not solely dependent on the social-psychological variables of the experimental setting. (c) Amnesia is not an all-or-none phenomenon—it occurs in varying degrees. The amount of material temporarily forgotten depends on the depth of hypnosis (Hilgard, 1965). Only the most deeply hypnotized subjects fail to recall at least some of the experiences of hypnosis, and even these subjects, when pressed, may comment on their subjective experiences and elaborate on incidental details of the procedures. (d) The reports of subjects who successfully recall some of the hypnosis events shed light on the phenomenological aspects of amnesia. Some subjects can give only a vague, fragmentary outline of the hypnosis session, recalling a few events after considerable difficulty. These subjects frequently show marked confusion about the sequence of events in hypnosis or about concrete details of the suggestions. This is in contrast to the ease and clarity of recall by these subjects after amnesia has been lifted by the prearranged cue (Evans, 1965).

Several experimental results, then, when considered along with the phenomenological quality of the subject's verbal reports during amnesia, suggest that the subject may be actively trying to recall, rather than simply blocking out the material, or failing to verbalize it. If as Hull (1933) originally proposed, the processes underlying posthypnotic amnesia take place at the level of memory retrieval rather than at the levels of information acquisition or storage, it would seem more appropriate to examine the *process of retrieval* during posthypnotic amnesia rather than the presumed *effects of forgetting*.

It is possible to study the retrieval process only if some material is actually recalled by the subject. Therefore, this report will include only those subjects who remember some of the experiences of hypnosis; those subjects who exhibit the phenomenon in extreme form (complete amnesia) have been eliminated from

the analysis. Among those subjects who remember some events in spite of the suggestion for complete posthypnotic amnesia, there should be a qualitative difference in the recall of subjects who are responding positively to hypnosis, compared to those subjects who are having few or no hypnotic experiences.

Posthypnotic Amnesia and the Organization of Recall

A shift in focus from forgetting to remembering during posthypnotic amnesia allows the investigator to take advantage of some of the techniques developed to study the organization of recall (Bousfield, 1953; Tulving, 1962), which have provided valuable information regarding the dynamics and structure of memory. This research has shown that identifiable principles are involved in organizing learned or experienced material into structured relationships—what Bartlett (1932) called *schemata*—so that they can be efficiently used in later cognitive operations, such as recall. The organization of recall draws upon many sources, including conceptual categories and structural similarity (for verbal material), or outstanding details and spatio-temporal context (for experiences), etc. The importance of organization in achieving recall has been dramatically illustrated by the “tip-of-the-tongue” phenomenon (Brown & McNeil, 1966). Cofer (1969) showed that when the organization of recall is somehow disrupted, the subject recalls fewer correct items, with more difficulty, and expresses less confidence in the accuracy of his recall.

The facts of posthypnotic amnesia—temporary failure of recall while other memory processes remain relatively undisturbed, the loss of contextual aspects of memories, confused and fragmentary recall, and the difficulty encountered by some subjects in retrieving those items that they do remember—point to the disorganization of recall as an important mechanism of posthypnotic amnesia. A number of recent experiments (Tulving, 1972; Tulving & Madigan, 1970) have demonstrated that temporal “tags” are associated with memories and that recall of an event requires the specification of its relation to other events. It seemed likely that the disruption of recall hypothesized to occur in posthypnotic amnesia would involve the temporal context in

which memories for events and experiences are embedded. A partial effect of amnesia observable in those subjects who do remember some hypnotic experiences might involve a disruption of the orderly sequence typically observed in the recall of serially presented events. It was hypothesized that among those subjects who do remember some of the experiences of hypnosis, hypnotizable subjects (showing partial effects of the amnesia suggestion) should retrieve the events of hypnosis in a more random manner than the organized and sequential remembering of insusceptible subjects.

METHOD

Subjects

The Harvard Group Scale of Hypnotic Susceptibility, Form A (HGSHS:A) of Shor and Orne (1962) was administered by a standardized tape recording to 168 male college student volunteers. The 112 subjects who could be rescheduled received individual administrations of the Stanford Hypnotic Susceptibility Scale, Form B (SHSS:B) and Form C (SHSS:C) of Weitzenhoffer and Hilgard (1959, 1962).³ Each scale was administered by a different experimenter on a different day. Because the SHSS:C is a more adequate measure of hypnotizability, subjects were classified on the basis of SHSS:C scores as low (0-4), medium (5-7), or high (8-12) in susceptibility to hypnosis ($N = 40, 27,$ and $45,$ respectively).

Procedure

Each of the standardized scales consists of an induction of hypnosis accompanied by 12 representative hypnotic experiences. The last of the items in each scale is the suggestion of amnesia for the events of the hypnosis session:

When I get to "one" 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 have 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

³ Mean susceptibility scale scores for the group of 112 subjects were: for the HGSHS:A, 6.49; for the SHSS:B, 6.68; and for the SHSS:C, 6.25. These scores are representative of similar volunteer samples. Six subjects were available for only one additional session and therefore received the SHSS:C without the SHSS:B. During the three scales there were, respectively, 25, 26, and 22 subjects who had complete amnesia (i.e., recalled less than three items in the amnesia condition). These subjects were excluded from the analysis of organization of recall.

TABLE 1
INITIAL SCALE ITEM RECALLED BY LOW AND HIGH
HYPNOTIZABLE SUBJECTS DURING AMNESIA ON
THE STANFORD HYPNOTIC SUSCEPTIBILITY
SCALE, FORM C

Initial item recalled	Number of subjects recalling item		χ^2
	High	Low	
Item 1	8	34	16.41*
Any other item	15	6	

* $p < .001.$

anything until then . . . [Weitzenhoffer & Hilgard, 1962, pp. 29-30].

After hypnosis has been terminated, the experimenter says to the subject, "Now please tell me in your own words everything that has happened since you began looking at the target [Weitzenhoffer & Hilgard, 1962, p. 30]." The subject is allowed to respond freely until he indicates that he can remember nothing more. No instructions are given regarding the exact manner of recall. Those subjects who recall three or less of the critical items are scored by standardized criteria as passing the amnesia item. Reports of items recovered immediately after termination of hypnosis constitute the *amnesia* condition; additional responses given after the cue to lift amnesia comprise *reversibility*.

RESULTS

Temporal Disturbance in Recall during Amnesia

The hypothesis that hypnotizable subjects would be less likely than insusceptible subjects to recall the experiences of hypnosis in accurate temporal sequence was tested by examining the first item recalled by the subjects and by investigating the temporal sequencing of recall.

Differential recall of the first item. The first item administered after the induction of hypnosis was typically not the first item recalled by hypnotizable subjects during amnesia testing (Table 1). In contrast, the first item in the scale was recalled first by insusceptible subjects almost to the exclusion of the other items. On the SHSS:C, for example, 34 of 40 insusceptible subjects, but only 8 out of 23 hypnotizable subjects, recalled the first item first ($\chi^2 = 16.41, p < .001$).⁴

The differential recall of the first item suggested that the temporal order of item adminis-

⁴ Unless otherwise noted, all statistical tests are one-tailed.

TABLE 2
FREQUENCY OF ORDERED AND RANDOM RECALL (RHO) DURING AMNESIA FOR SUBJECTS OF LOW (L), MEDIUM (M), AND HIGH (H) SUSCEPTIBILITY TO HYPNOSIS

Rho	HGSHS:A			SHSS:B			SHSS:C		
	L	M	H	L	M	H	L	M	H
Ordered	22	12	8	19	3	4	22	6	3
Random	15	11	19	18	17	19	18	21	20
χ^2	5.75*			11.18**			13.04***		

* $p < .05$,
 ** $p < .005$,
 *** $p < .001$.

tration was a principal mode of organization for insusceptible subjects but not for hypnotizable subjects. Consequently, the temporal order of recall used by subjects during amnesia was investigated.

Temporal sequencing. In order to determine whether subjects' recall was organized according to the chronological sequence of the suggested hypnotic experiences, order-of-retrieval scores (rho scores) were calculated for each subject who recalled at least three items. Rho is the Spearman rank-order correlation between the order of administration of the scale items and the order in which the events were reported to experimenter during amnesia testing. Each score is the correlation between the order in which the subject recalled those items that he could remember and the order in which he experienced them during the hypnosis session. Recall was considered *ordered* when the rho score was positive and statistically significant ($p < .05$); otherwise, rho was considered *random*.

Amnesia condition. Scores for each subject

were entered into contingency matrices according to hypnotizability (low, medium, or high) and rho score (ordered or random). The resulting chi-square tests (Table 2) were significant for each scale (e.g., on the SHSS:C, $\chi^2 = 13.94$, $p < .001$). On all forms of the scale there was clear indication that subjects of relatively high hypnotizability remembered events out of correct order.

Analysis of variance (Table 3) of the mean rho scores for each group of subjects also demonstrated a significant negative relationship between hypnotizability and orderliness of recall. Individual *t* tests between groups of hypnotizable and insusceptible subjects showed that the mean rho scores of hypnotizable subjects were significantly lower than those of insusceptible subjects (e.g., on the SHSS:C, $t = 3.34$, $p < .001$).

The correlations between rho and the corresponding number of items recalled were significant for the SHSS:B ($r = .23$, $p < .025$) and SHSS:C ($r = .20$, $p < .05$). These low correlations, together with other results reported below, indicate that the lower rho scores of hypnotizable subjects are not artifacts of the fewer number of items recalled during amnesia by those subjects.

Reversibility condition. After amnesia had been lifted, there did not seem to be a differential effect of hypnotizability on the order of retrieval. The small number of insusceptible subjects in this condition, however, precluded a thorough analysis in this study.

Temporal disruption and hypnotizability. The subjects were divided into three groups: (a) those who had total amnesia (subjects who recalled less than three items and who were excluded from the analysis of organization in

TABLE 3
ORGANIZATION OF RECALL DURING AMNESIA FOR SUBJECTS OF LOW, MEDIUM, AND HIGH SUSCEPTIBILITY TO HYPNOSIS

Scale	Mean rho score			Analysis of variance			High and low subjects compared		
	Low	Medium	High	<i>F</i>	<i>df</i>	<i>p</i> <	<i>t</i>	<i>df</i>	<i>p</i> <
HGSHS:A	.80	.70	.67	1.44	2/84	ns	1.94	62	.05
SHSS:B	.58	.17	.39	3.69	2/77	.05	1.47	58	.10
SHSS:C	.55	.31	.08	5.38	2/87	.01	3.34	61	.001
<i>N</i> ^a	40	27	23						

^a Based on the SHSS:C. As some subjects recalled less than three items on one or two of the scales, *N* for the HGSHS:A and the SHSS:B varied slightly (see *df* columns).

recall); (b) those who recalled three or more items with random rho scores; and (c) those who recalled three or more items with ordered rho scores. Analysis of variance (Table 4) of the mean SHSS:C scale scores for the three groups showed that the degree of temporal disruption was directly related to hypnotic susceptibility. Those subjects with temporally disrupted recall consistently obtained higher scores on SHSS:C than those whose recall was ordered.

Subjective Organization of Recall

The recall of hypnotizable subjects during the amnesia condition seemed to occur in an idiosyncratic and random fashion. The group of insusceptible subjects, in contrast, tended to recall the same pairs of items together. On the SHSS:C for example, unique item pairs (only one subject in a group recalled a particular pair of items in a particular sequence) accounted for 51% of recalled item pairs in hypnotizable subjects but only 28% for insusceptible subjects. On the other hand, common sequences (three or more subjects recalled the same particular permutation of two items) accounted for 48% of the recalled pairs in the insusceptible group and only 24% in the hypnotizable group.

To evaluate whether the groups of hypnotizable and insusceptible subjects differed in the way they went about the task of recalling during amnesia, an index of organization of recall was calculated. The overall sequential organization of the material recalled by the subjects was investigated by tabulating the frequency with which any item was recalled following any other item. On each scale the items recalled during amnesia were pooled for the groups of hypnotizable and insusceptible subjects. All observed pairs of consecutively recalled events were tabulated in a contingency matrix similar to that used in the determination of second-order behavioral stereotypy (redundancy in behavior) by Miller and Frick (1949). From the frequencies entered into the cells and marginals of the matrix, an index of subjective organization in recall (SO) was calculated from the formula provided by Tullving (1962):

$$SO = \frac{\sum n_{ij} \log n_{ij}}{\sum n_i \log n_i}$$

TABLE 4

THE PREDICTION OF SUSCEPTIBILITY TO HYPNOSIS (SHSS:C) FROM THE CHARACTERISTICS OF POSTHYPNOTIC AMNESIA DURING STANDARDIZED SCALES

Amnesia	Temporal order of recall			N	F ^b
	Complete amnesia ^a (<3 items)	Disrupted (insignificant rho)	Organized (significant rho)		
HGSHS:A	8.42	6.33	4.79	112	14.4*
SHSS:B	8.56	6.11	3.88	106	22.1*
SHSS:C	10.23	6.19	3.84	112	52.2*

^a These subjects were not included in the analysis of disorganized retrieval.

^b For each scale, each pair of means differs significantly from each of the others, minimum *p* < .01.

* *p* < .001.

where *i* and *j* indicate the ordinal position of the *n*th and the (*n* + 1)th items recalled, respectively.

The SO index is a ratio of the actual organization (degree of stereotypy in recall) observed in the data to the maximum organization possible. A value close to 0.0 indicates that all the cells have approximately the same frequency and that all permutations of items have the same probability of occurring in recall: the recall of each subject is idiosyncratic. A score close to 1.0, on the other hand, indicates that some permutations are more likely to be recalled than others: all subjects are recalling the items in approximately the same order.

Calculation of SO for groups of hypnotizable and insusceptible subjects on all three scales indicated less subjective organization in the recall of scale items by hypnotizable subjects than by insusceptible subjects (on the HGSHS:A, .51 versus .58; on the SHSS:B, .41, versus .49; and on the SHSS:C, .32 versus .48). Thus, even when no *specific* mode of organization of recall was imposed on the analysis, insusceptible subjects tended to recall the events in a more consistent, organized fashion than did hypnotized subjects.

DISCUSSION

An effective posthypnotic suggestion for amnesia appears to have subtle but identifiable effects on the memory process. There is a greater degree of overall disruption in the retrieval of hypnosis events by hypnotizable subjects, compared to those who are insusceptible to hypnosis. Specifically, hypnоти-

zable subjects tend to recall those events that they can remember randomly, whereas insusceptible subjects tend to proceed in an orderly manner, essentially following the order of item presentation. Unlike the hypnotizable subject, the insusceptible subject typically recalls the initial hypnosis events first and continues to recall succeeding events in correct temporal order.⁵

It appears that the present defining characteristics of posthypnotic amnesia (the inability to recall recent hypnotic experiences and the subsequent reversibility of the forgetting) should be expanded to include disorganized retrieval. Each of these aspects is directly related to depth of hypnosis. When the subject recalls none of his hypnosis experiences the effects of the amnesia suggestion are quite clear, provided of course that the material is recovered when amnesia is lifted. However, when the subject is able to recall some of his experiences, it is important to examine the temporal sequence of recall in order to evaluate whether the amnesia suggestion has been effective.

While hypnotizable subjects with partial amnesia do not use temporal order as a principal organizational mode to aid remembering, it is possible that these subjects utilize entirely different modes of organization in recalling those items that they can remember. However, the few attempts to investigate such organizational strategies have not produced encouraging results. Hilgard and Hommel (1961) reported that such cues as serial position and item difficulty do not account for the recall of either hypnotizable or insusceptible subjects. There is some tendency for subjects to remember those suggestions that were successfully experienced (Hilgard & Hommel, 1961), but this appears to be primarily true for insus-

ceptible subjects, for whom a few successful experiences stand out in contrast to the majority of the unsuccessful suggestions (O'Connell, 1966). The results of the analysis of the subjective organization of the recalled material indicate that no single set of organizational cues was being used by the group of hypnotizable subjects as a whole. However, it is possible that there are recall strategies that may be idiosyncratic to each hypnotized subject; such strategies would not be isolated by the techniques of analysis so far employed.

Studies focusing on what the hypnotized subject remembers have made clear that the ablation theory of posthypnotic amnesia cannot be integrated with existing data. Rather, the hypnotized subject has difficulty recalling his experiences because of a temporary disruption of the *retrieval* process induced by the amnesia suggestion. Obviously, the subject cannot report experiences that he cannot remember, even though at another level the experiences remain available to be used in other cognitive operations (e.g., recognition or re-learning) which make use of different access routes to memory. The apparent paradox of the simultaneous availability yet inaccessibility of memories is not unique to hypnosis. In everyday life, the inability to remember material that is obviously present in memory can also be seen in the "tip-of-the-tongue" phenomenon as well as other all-too-familiar quirks of memory. These mechanisms have been documented in laboratory studies of normal memory (Tulving & Pearlstone, 1966) in which information available in the memory store becomes inaccessible to recall due to a failure to use retrieval cues or to the lack of such tags. When retrieval cues are not used efficiently, active recall of the memories becomes difficult. However, other cognitive operations, not so dependent upon these cues, may still be performed with the material.

When material is remembered in one form but not in another, whether in normal memory or in posthypnotic amnesia, a paradox exists only if the emphasis is placed on the forgotten material or if the material is thought of as ablated. If the nature of the retrieval process becomes the focus of investigation, the same material may seem to be simultaneously "forgotten" and "remembered," not in terms

⁵ The time reference in the instruction for amnesia testing—"Please tell me now in your own words everything that has happened since you began looking at the target [Weitzenhoffer & Hilgard, 1962, p. 30]"—may indicate that temporal order is desired in the subject's response. If the subjects were influenced by this cue, then it is likely that all subjects would have recalled the events in temporal order. This study suggests that order of retrieval may be an unobtrusive measure of amnesia, since the disorganization of recall is not presented as germane to the behavior implicitly demanded of the subjects.

of what measure of memory is used but rather in terms of the kinds of organizational tags available to the hypnotized subject who is actively attempting to retrieve information. In isolating a temporary disruption of one organizational scheme, the results of the present study suggest that the most promising area for future research into the mechanisms of posthypnotic amnesia is not in further examination of the parameters of the inaccessible material but rather in the study of the nature of the memory retrieval process.

In summary, the present study indicates that suggestions of posthypnotic amnesia are effective for hypnotized subjects because of a temporary disruption in the normal retrieval process. Some of the cues that normally aid the process of recall, such as the temporal sequence of a series of events, are not utilized as effectively as in normal waking memory. An extreme form of this loss of temporal and contextual "tags" occurs with source amnesia (Evans, 1971; Evans & Thorn, 1966), in which the subject can remember information but cannot locate it within a temporal context. Thus, while amnesic subjects are still able to behave in some ways as if they remember the material, they carry out retrieval haphazardly and with difficulty. Posthypnotic amnesia seems to involve a blurring of the context in which certain memories are embedded, resulting in cognitions that for a time are only tenuously linked with waking experience and memory.

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