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The Use of Hypnosis to Enhance Recall

Abstract. *The forensic use of hypnosis is increasing. A hypermnesic procedure was used in an experiment that calls this practice into question. Subjects tried for a week to recall 60 previously presented pictures. They were then either hypnotized or not and encouraged to recall even more pictures. Most of the newly recalled material was incorrect, especially for highly hypnotizable subjects in the hypnosis condition. Such errors in recall can have profound implications for forensic investigations.*

The increased use of hypnosis in forensic investigation has become controversial (*1*). Although numerous case reports attest to the utility of hypnosis in enhancing the recall of the eye witness (*2*), controlled studies have produced conflicting results. Some studies have failed to demonstrate hypnotic hypermnesia, whereas those that have (*3*), have not reported errors in a systematic way nor controlled for the natural hypermnesic effects that can be achieved through repeated testing (*4*). Still others (*5*) have found that hypnotized subjects are susceptible to leading questions. Although scientists are wary of the reliability of forensic hypnosis, police investigators are lobbying to sanction its use in criminal investigation and the judiciary is seeking evidence on which to base legal decisions. The relation between hypnosis and memory enhancement needs to be clarified.

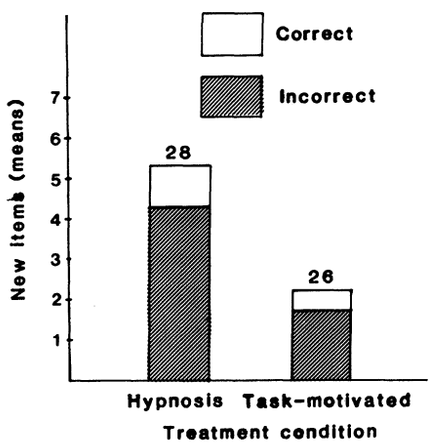

Fig. 1. New items presented as memories by subjects after hypnotic or task-motivating suggestions to enhance recall. All items were designated by subjects as true memories. The number of subjects in each group is shown above each bar.

We now report that any pressure to enhance recall beyond the initial attempt may increase the number of items recalled but increase the number of errors as well. The use of hypnosis exaggerates this process, particularly for those with hypnotic ability. When hypnotized, the highly hypnotizable subjects recalled twice as many new items as controls but made three times as many new errors.

Fifty-four subjects were selected on the basis of their hypnotic ability as measured by a group adaptation of the Stanford C Scale of Hypnotic Susceptibility (SHSS:C) (*6*). Subjects with low susceptibility had SHSS:C scores from 1 to 6, and those with high susceptibility, from 7 to 12. All subjects were presented with a series of 60 slides of simple black-and-white line drawings of common objects (*7*), presented at a rate of 3½ seconds per slide. They were then given a recall sheet and requested to write the name of a line drawing in each of the 60 blank spaces provided for this purpose, indicating as well which items represented memories and which were just guesses. This forced recall procedure is standard in hypermnesia studies (*8*). Subjects were initially given three trials in the laboratory with 3-minute rest periods between trials.

Subjects were then instructed that during the next week they were to recall as many of the line drawings as they could once each day, and to write their recollections on the take-home recall sheets provided. They were asked to deposit each recall sheet in a convenient drop-box daily for 6 days. Altogether, subjects completed nine trials over a period of 7 days before their second laboratory session.

The mean number of items recalled on the first trial was 30. By trial 9 the cumulative mean had risen to 38 items—an increase of 27 percent. The number of errors increased as well, from an average of less than one error on the first trial to an average of four errors by the ninth. Most subjects approached asymptotic levels of output by about trial 7, 4 days after a single viewing of the stimuli.

The next step was to see whether hypnotic suggestions for increased recall would enable subjects to retrieve more information after asymptotic recall had been reached. During this second laboratory session, subjects were told to relax and focus all their attention on the slides they had seen the week before. They did so either while hypnotized (hypnosis condition) or without hypnosis (task-motivated condition). Before this session subjects did not know which condition they would be in, and the experimenters were unaware of subjects' hypnotic ability. Consistent with these precautions, independent sample *t*-tests indicated no difference between high and low susceptible subjects in the cumulative number of correct items retrieved over the week before treatment [$t(26) = 0.49$] or for the cumulative errors retrieved prior to treatment [$t(26) = 0.14$].

Figure 1 illustrates the number of items reported on the treatment trials that had never been reported as memories before. Subjects in the hypnosis group reported over twice as many new items (both correct and incorrect) as subjects in the task-motivating condition did. The correct information retrieved by subjects in both conditions remained proportional to this shift in total output. Those higher in hypnotic ability in the

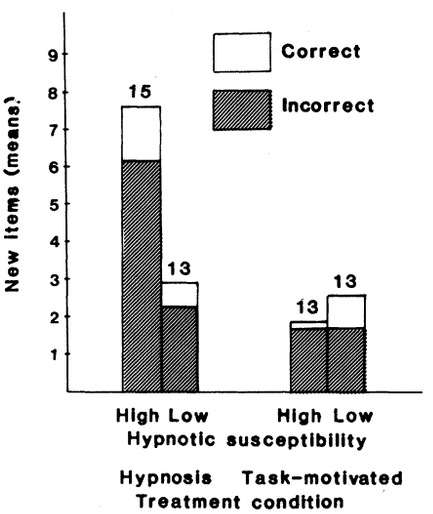

Fig. 2. New items presented as memories by subjects of high and low susceptibility to hypnosis after hypnotic or task-motivating suggestions to enhance recall. The number of subjects in each group is shown above each bar.

hypnosis condition were primarily responsible for the increase in output, and hypnotic suggestion was no more potent than task motivating suggestion for those lower in hypnotic ability (Fig. 2).

A two-way analysis of variance based on the total increase in items indicates a significant main effect for condition [$F(1, 50) = 5.63$, $P < 0.03$] and a significant interaction of condition with hypnotic susceptibility [$F(1, 50) = 4.31$, $P < 0.05$]. When just the correct information was considered, the interaction between condition and hypnotic ability was significant as well [$F(1, 50) = 4.95$, $P < 0.05$]. Using new errors as the dependent measure yielded a significant main effect for condition [$F(1, 50) = 5.38$, $P = 0.03$], but the interaction in this case was not statistically significant [$F(1, 50) = 3.10$, $P = 0.08$]. Even though hypnotizable subjects in the hypnosis condition showed a statistically significant increase in accurate recall, this increase was small in absolute terms. No subject in even this most responsive group retrieved more than five new correct items (mean = 1.40), and six of them failed to produce any new correct information at all. The cost of correctly recalling these few items was considerable, since it was accompanied by almost three times as many errors as were made by subjects in any other condition. We have replicated this pattern of results on a new sample of 56 subjects (*9*).

The probability of correctly recalling new items under hypnosis seems directly related to the number of items a subject is willing to report as memories, a finding that could be interpreted as being due to a shift in report criterion. That is, the increase in correct recall may not represent increased sensitivity to memory traces, but may instead result from less caution by subjects in what they are willing to report as memories. This criterion shift could be attributed to various demand characteristics, social cues, and expectations engendered by the hypnotic situation.

Another possible explanation for the effect of hypnosis on memory depends less on a shift in the report criterion than on the frequency with which the individuals' criterion for memorial judgment is subjectively met. Hypnosis may heighten the sense of recognition associated with even falsely recalled items, in effect "fooling" a central processor or editor responsible for memorial judgments (*10*). It may be that one of the criteria upon which this sense of recognition is based is the vividness with which the subject is able to envision those items generated as possible memories during recall attempts. If hypnosis enhances the vividness of mental imagery (*11*), perhaps the vividness with which the subject is able to envision these possibilities becomes compelling. Under these circumstances, the editor could mistake vividly imaged possibilities for memories of the stimuli; the enhanced vividness could lead to a false sense of recognition and hence the inflated output as well as the surprising certainty that subjects have about their hypnotically enhanced recall (*12*).

The role that affect may play in the relationship between hypnosis and memory has not been explored in this investigation, but may be relevant to the use of hypnosis in forensic settings. Nonetheless, our observations of hypnotically enhanced recall should give pause to those advocating the use of hypnosis in situations in which the veridicality of information is of prime concern.

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7. The slides were selected to be high on image and name agreement from a set of pictures that had been normalized on a number of dimensions relevant to memory studies [J. G. Snodgrass and M. Vanderwart, *J. Exp. Psychol. Hum. Learn. Mem.* **6**, 174 (1980)]. This selection procedure ensured against ambiguity in scoring.
8. The hypermnesic function has been replicated in numerous studies that used repeated recall over the course of single laboratory session [for example, A. D. Yarmey, *Bull. Psychonom. Soc.* **8**, 115 (1976)] and over the course of a week [M. H. Erdelyi and J. Kleinbard, *J. Exp. Psychol.: Hum. Learn. Mem.* **4**, 275 (1978)].
9. All subjects were hypnotized, with those unresponsive to hypnotic suggestion serving as controls. The susceptible subjects reported significantly more information in response to hypnotic suggestion than the unsusceptible subjects [$t(27) = 2.68$, $P < 0.01$]. However, only 10 percent of the new information reported by either group was accurate. While hypnosis produced a small but significant increase in new information [$t(27) = 1.90$, $P < 0.05$], it also produced a significant increase in new errors [$t(27) = 2.67$, $P < 0.01$]. Since this replication examined specific hypotheses, one-tailed tests were used.
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11. Experimental evidence on this point is controversial since most studies base their results solely on self-rating scales. H. J. Crawford, using self-rating scales and an objective performance criterion, reported a shift in the vividness of visual imagery during hypnosis for those in the upper range of hypnotic ability [paper presented at the National Meeting of the Society of Clinical and Experimental Hypnosis, Denver, Colo., October 1979].
12. Pseudomemories, originally developed in hypnosis, may come to be accepted by the subject as his actual recall of the original events; they are then remembered with great subjective certainty and reported with conviction [M. T. Orne, *Int. J. Clin. Exp. Hypn.* **27**, 331 (1979)].
13. We thank S. Vandermeulen and D. Chansonneuve for assistance in collecting and scoring the data; S. Segalowitz, J.-R. Laurence, E. Woody, and M. P. Bryden for their advice and editorial comments; and all members of the University of Waterloo Hypnosis Research Team for their suggestions and encouragement. Supported in part by Social Sciences and Humanities Research Council grant 037-8195.

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Transported Proteins in the Regenerating Optic Nerve: Regulation by Interactions with the Optic Tectum

Abstract. *The transport of specific proteins in regenerating optic fibers of goldfish depends on the presence or absence of the optic tectum. When optic fibers were allowed to contact the tectum, amounts of rapidly transported proteins having molecular weights between 120,000 and 160,000 increased, and a species of molecular weight 26,000 reverted to normal levels. When nerves were prevented from contacting the tectum, the amount of the 26,000–molecular weight protein remained high for months. Amounts of other transported proteins, in particular a group of acidic components of molecular weight 44,000 to 49,000 that increase greatly at early stages of regeneration, proved to be independent of the tectum.*

In neurons, many constituents of the nerve terminal membranes are synthesized in the cell body and conveyed to the terminals in the rapid phase of axonal transport (*1, 2*). Thus, during the development or regeneration of neural connections, changes in the complement of rapidly transported proteins might be expected, in response to the cell's shifting requirements for components involved in such processes as axon elongation, target recognition, and synaptogenesis. Growth-related changes in rapid axonal transport have now been demon-