

Hypnosis, memory and amnesia

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SUMMARY

Hypnotized subjects respond to suggestions from the hypnotist for imaginative experiences involving alterations in perception and memory. Individual differences in hypnotizability are only weakly related to other forms of suggestibility. Neuropsychological speculations about hypnosis focus on the right hemisphere and/or the frontal lobes. Posthypnotic amnesia refers to subjects' difficulty in remembering, after hypnosis, the events and experiences that transpired while they were hypnotized. Posthypnotic amnesia is not an instance of state-dependent memory, but it does seem to involve a disruption of retrieval processes similar to the functional amnesias observed in clinical dissociative disorders. Implicit memory, however, is largely spared, and may underlie subjects' ability to recognize events that they cannot recall. Hypnotic hypermnesia refers to improved memory for past events. However, such improvements are illusory: hypermnesia suggestions increase false recollection, as well as subjects' confidence in both true and false memories. Hypnotic age regression can be subjectively compelling, but does not involve the ablation of adult memory, or the reinstatement of childlike modes of mental functioning, or the revivification of memory. The clinical and forensic use of hypermnesia and age regression to enhance memory in patients, victims and witnesses (e.g. recovered memory therapy for child sexual abuse) should be discouraged.

1. INTRODUCTION

Hypnosis is a social interaction in which one person, called the subject, acts on suggestions from another person, called the hypnotist, for imaginative experiences involving alterations in cognition and voluntary action. Among those individuals who are most highly hypnotizable (Hilgard 1965*b*), these alterations in consciousness are associated with subjective conviction bordering on delusion, and an experience of involuntariness bordering on compulsion. Comprehensive treatments of hypnosis are provided by Hilgard (1965*a,b*, 1975), Kihlstrom (1985*a*), Fromm & Nash (1992), and Kirsch & Lynn (1995).

2. POSTHYPNOTIC AMNESIA

On termination of hypnosis, some subjects find themselves unable to remember the events and experiences that transpired while they were hypnotized (for a review, see Kihlstrom 1985*b*; Kihlstrom & Barnhardt 1993). This posthypnotic amnesia does not occur unless it has been specifically suggested to the subject, and the memories are not restored when hypnosis is reinduced; thus it is not a form of state-dependent memory. However, it is temporary: on administration of a pre-arranged cue, the amnesia is reversed and the formerly amnesic subject is able to remember the events perfectly well. Reversibility marks posthypnotic amnesia as a disruption of memory retrieval, as opposed to encoding or storage, somewhat like the

temporary retrograde amnesias observed in individuals who have suffered concussive blows to the head. The difference, of course, is that posthypnotic amnesia is a functional amnesia, an abnormal amount of forgetting which is attributable to psychological factors rather than to brain insult, injury or disease (Schacter & Kihlstrom 1989). In fact, posthypnotic amnesia has long been considered to be a laboratory model of the functional amnesias associated with hysteria and dissociation (Kihlstrom 1979).

Without any doubt, the most interesting findings of amnesia research are of dissociations between explicit and implicit memory (Schacter 1987, 1995), and posthypnotic amnesia is no exception. In fact, some of the earliest experimental studies of this dissociation were performed in a hypnotic context. Studies in this line go back at least as far as the classic work of Hull (1933), who demonstrated that posthypnotic amnesia for practice trials conducted in hypnosis had no effect on savings in posthypnotic relearning of a stylus maze, paired associates and complex mental addition, demonstrations of a dissociation between explicit episodic memory and implicit procedural knowledge. Nor does amnesia affect proactive or retroactive interference, illustrating a dissociation between an explicit direct test of episodic memory and an implicit indirect test (for a review, see Kihlstrom & Barnhardt 1993). One of these was a demonstration of source amnesia by Evans & Thorn (1966; Evans 1979). In these experiments, hypnotized subjects were incidentally taught the answers to obscure factual questions like 'An

amethyst is a blue or purple gemstone: what colour does it turn when exposed to heat?' (answer: yellow). Although the highly hypnotizable subjects came out of hypnosis with a dense posthypnotic amnesia, approximately one-third of them were able to answer these questions correctly. There was no evidence of source amnesia in a group of subjects instructed to simulate hypnosis. Thus, these subjects retained access to new semantic knowledge acquired during hypnosis, even though they had no conscious recollection of the learning experience.

Another explicit-implicit dissociation was revealed in an early experiment from my laboratory in which highly hypnotizable subjects memorized a list of 15 unrelated words to a criterion of two perfect repetitions, and then received a suggestion for amnesia (Kihlstrom 1980, experiment 1). When these subjects were awakened and tested by the method of free recall, they remembered virtually none of the list items. Later, however, they completed a free-association test in which half the cues targeted critical items from the study list as the most frequent normative response, and the other half targeted matched neutral items that had not been studied. The amnesic subjects generated many critical targets on this test. Moreover, comparing associations to critical and neutral targets, the amnesic subjects showed a clear priming effect, which was equivalent to that shown by insusceptible subjects who were nonamnesic. Following the free-association test, the subjects were given a second test of free recall, which yielded only slightly better results than the first one. Apparently, generating significant numbers of list items as free associates generally did not remind the hypnotizable, amnesic subjects of any of the words they had memorized earlier. However, when the prearranged reversibility cue, 'Now you can remember everything!', was administered, free recall returned to baseline levels.

In a conceptual replication (Kihlstrom 1980, experiment 2), another group of subjects showed a dense posthypnotic amnesia for a list of categorized words, but showed significant priming when asked, while amnesic, to generate instances of critical and neutral categories.

More recently, Dorfman and I reported on a further study of posthypnotic amnesia in which the tests of explicit and implicit memory were matched for their cue value (Dorfman & Kihlstrom 1994). As before, the subjects were presented with close associates of list items; for half the items they were asked to report a related item from the study list (an explicit test of cued recall), while for the other half they were asked merely to report the first word that came to mind (an implicit test of priming in free association). In this experiment, we observed a double dissociation: among the highly hypnotizable subjects, suggestions for posthypnotic amnesia impaired performance on the explicit memory test compared to un hypnotized controls, but enhanced performance on the implicit test. Note that the control subjects, who completed the study and test phases in the normal waking state, failed to show priming: postexperimental interviews, as well as follow-up research, indicated that these subjects

strategically withheld list items as free associates. The amnesic subjects could not do this, of course, because they were unaware of what they had learned.

Preserved priming on free-association and category-generation tasks, in the face of impaired recall, is a form of dissociation between explicit and implicit memory. But the case of posthypnotic amnesia is different, in at least three respects, from other amnesias in which this dissociation is observed. First, in contrast to the typical explicit-implicit dissociation, the items in question were deeply processed at the time of encoding. Recall that the list was not just presented for one study trial, but rather deliberately memorized over the course of several study-test cycles to a strict criterion of learning. Second, the priming which is preserved is semantic priming, and relies on the formation during encoding, and preservation at retrieval, of a semantic link between cue and target. This priming reflects deep, semantic processing, of a sort that cannot be mediated by a perceptual representation system. Third, the impairment in explicit memory is reversible: posthypnotic amnesia is the only case I know where implicit memories can be restored to explicit recollection. Taken together, then, these priming results reflect the unconscious influence of semantic representations formed as a result of extensive attentional activity at the time of encoding. The priming itself may be an automatic influence, but again it is not the sort that is produced by automatic processes mediated by a perceptual representation system.

Most theorists hold that explicit and implicit memory are based on two different memory systems in the brain, but if this is so, it also must be acknowledged that the two systems can interact in various ways. Consider, for example, the two-process theory of recognition, normally considered to be a facet of explicit memory, proposed by Mandler (1980). Mandler defines recognition as a 'judgment of prior occurrence', and argues that this judgement can be based on two sources: retrieval, where the event and the context in which it occurred is consciously recollected; and familiarity, where an item 'rings a bell' in the absence of actual recollection of its prior occurrence. While retrieval is tantamount to explicit memory, Mandler argues that familiarity has its source in the same activation process that, in his view, underlies priming effects in implicit memory. It follows, then, that recognition may occur, in the absence of free recall, whenever priming is preserved, so long as subjects are permitted, or even encouraged, to capitalize on the priming-like feeling of familiarity.

The superiority of familiarity-based over retrieval-based recognition is suggested by a study of recognition in posthypnotic amnesia (Kihlstrom 1985*b*; for a similar study of retrograde amnesia induced by electroconvulsive therapy, see Dorfman *et al.* (1995). In this study, highly hypnotizable subjects memorized a word-list while hypnotized, and then received a suggestion for posthypnotic amnesia. On a recognition test, they made confidence ratings on a 4-point scale, where 1 meant that the subject was certain that the item was not on the list; 2 that the subject thought the item was not on the list, but wasn't sure; 3 that the subject

thought the item was on the list, but wasn't sure; and 4 that the subject was certain that the item was on the list. Such a scale yields three different criteria for recognition: strict, counting only those items receiving a rating of 4; moderate, counting 3s as well as 4s; and liberal, counting even those items which received a rating of 2. Hits increased appreciably as the criterion was loosened; false alarms also increased, as might be expected, but not nearly at the same rate, so that shifting criteria yielded genuine increases in recognition. So, apparently, implicit memory can contribute to explicit memory, provided that subjects are permitted, or encouraged, to capitalize on the perceptual salience that comes with priming.

3. HYPNOTIC AGNOSIA

Posthypnotic amnesia is best construed as a disruption in episodic memory, that is, in the subject's ability to remember certain events and experiences. However, it should be noted that there is some evidence that hypnotic suggestion can produce impairments in semantic memory as well, that is, in the subject's ability to access generic, context-free, knowledge about the world. For example, Evans (1972) administered suggestions that the digit 6 would disappear from his subjects' number systems. When asked to count from 1 to 10, many subjects skipped lightly over the number 6, and had enormous difficulty when asked to perform additions in which the offending digit appeared in the problem, intermediate step or solution. Similarly, Spanos *et al.* (1982) taught subjects a list of words, and then suggested that following hypnosis they would be unable to think of them in any way. In contrast to subjects who received an amnesia suggestion, who displayed the priming effect observed by Kihlstrom (1980, experiment 1), these subjects showed no priming, although they remained able to use the list items as responses in a free-association test. Both experiments hint at a kind of agnosia suggested by hypnosis, that is, a difficulty in accessing generic, context-free, semantic or conceptual knowledge. Unfortunately, to date, there has been no experimental follow-up of either observation.

4. HYPNOTIC HYPERMNESIA

My own interest in hypnosis focuses on its negative effects on conscious awareness, that is, on how hypnotized subjects can fail to recollect events that they should remember perfectly well, fail to perceive pain in the face of a highly aversive stimulus such as cold pressor or ischaemia, or fail to see and hear events that are perfectly visible and audible in the stimulus environment. But a great deal of popular interest in hypnosis lies in its reputation as a means of transcending normal voluntary capacity (for a review, see Kihlstrom & Eich 1994). This popular reputation has spilled over into clinical work, so that some practitioners have attempted to use hypnosis to enhance muscular strength and endurance, learning ability and memory. And in particular, hypnosis has been used by police investigators to enhance memory

in witnesses and victims of crime; and by psychotherapists to exhume memories of incest, sexual abuse and trauma.

Now, there is no question that subjects who receive suggestions for performance enhancement often have the impression that their performance is in fact improved over baseline; the question is whether this impression is true or false. Alas, it appears to be largely false. Although there are many anecdotes of amazing feats performed by hypnotized subjects, controlled laboratory studies indicate that hypnosis cannot enhance performance, even among highly hypnotizable subjects (for reviews, see Kihlstrom & Barnhardt 1993; Kihlstrom & Eich 1994).

This holds true for memory as well: there is no evidence that hypnosis enhances accurate recollection. For example, Register and Kihlstrom (1987, experiment 2) asked subjects to study a set of pictures in the normal waking state; following an initial test of free recall, they were hypnotized, administered suggestions for improved memory and received a second recall test; they completed a third test after hypnosis was terminated. In line with results obtained by Erdelyi and many others (for reviews, see Erdelyi 1984; Kihlstrom & Barnhardt 1993), memory for the pictures improved over the three trials, an effect known as hypermnesia. However, the magnitude of the hypermnesia effect was not associated with the subjects' level of hypnotizability. There was as much hypermnesia among the insusceptible subjects, who for all intents and purposes were not hypnotized at all, as there was in the highly hypnotizable subjects, who should have profited most from the suggestions. Therefore, while some degree of hypermnesia does occur in the normal waking state, especially under conditions where the items were elaboratively processed at the time of encoding (Kihlstrom & Barnhardt 1993), hypnosis does nothing to enhance this process.

What hypnosis does appear to increase is false recollection. For example, Dywan (1988) administered tests of recognition in and out of hypnosis and discovered that hypnosis increased the frequency of false alarms, but not that of hits. Moreover, Whitehouse *et al.* (1988) found that hypnosis increased the confidence levels attached to items recalled by subjects, without increasing the accuracy of recall itself.

Dywan (1995) has proposed that the suggestive atmosphere of hypnosis interacts with the reconstructive nature of memory retrieval to create, or enhance, an illusion of remembering. Moreover, perhaps by virtue of increased suggestibility, hypnotized subjects may be more vulnerable to postevent misinformation effects (Putnam 1979). Once established, hypnotically induced paramnesia can be hard to shake. Laurence & Perry (1983) falsely suggested to a group of highly hypnotizable subjects that they had awakened to a noise on a particular night. After termination of hypnosis, all of these subjects remembered this event as if it had actually occurred, and almost half of them maintained this belief even after they were informed that the memory had been suggested to them by the hypnotist. Again, we are reminded that hypnotic suggestions involve what Sarbin & Coe (1972) have

called 'believed-in imaginings', subjectively compelling distortion in the perception of reality.

5. HYPNOTIC AGE REGRESSION

The centrality to hypnosis of believed-in imaginings is dramatically revealed in another phenomenon relevant to memory, that of age regression. In this phenomenon, it is suggested to subjects that they are turning back the calendar, and will relive an experience from some time and place in the past. The result can be a subjectively compelling return to childhood, as well as an objectively convincing display of childlike behaviour. But again, we have to distinguish between the imaginative experience constructed by hypnotic suggestion and the real thing: age-regressed subjects may genuinely believe that they are children again, and may behave in a childlike manner, but they do not grow smaller in the chair. For a long time there has been interest in what is happening psychologically to adults who have been regressed to childhood: to what extent do they return to mental states characteristic of childhood, or, as Nash (1987, p. 42) put it, 'What, if anything, is regressed about hypnotic age regression?'

There are at least three different facets of age regression which bear on questions of hypnosis and memory (Kihlstrom & Barnhardt 1993). First is ablation: to what extent does an age-regressed person lose access to the fund of knowledge and repertoire of skills characteristic of his or her chronological age? This is really a question about both amnesia and agnosia, because the loss of access extends to semantic and procedural knowledge as well as episodic memory. The question of ablation is generally coupled to the conceptually distinct question of reinstatement: to what extent does an age-regressed adult return to archaic (to use a psychoanalytic concept), or at least chronologically earlier, modes of cognitive and emotional functioning? Ablation and reinstatement have been of considerable interest to developmental psychologists, especially those who embrace Piagetian ideas about qualitatively different stages in cognitive development. For example, what happens to pre-operational thought when a child moves into concrete operations? If one could somehow abolish conservation, and reinstate pre-operational modes of thought, that would tell us that these childlike modes of thinking may be preserved in the adult brain.

Of course, such a finding would also make it a lot easier to do developmental research: if you can regress an adult to infancy, you do not have to cool your heels waiting for children to grow up. Something like this was actually attempted by Reiff & Scheerer (1959), with what appeared to be positive results, but a very careful replication by O'Connell *et al.* (1970) either failed to replicate their results or showed that they were artefacts of the demand characteristics of the testing situation. In a similar vein, studies employing a wide variety of experimental paradigms, including the Babinski reflex, various illusions which show developmental trends, and a host of tasks derived from the developmental theories of Heinz Werner and Jean Piaget (not to mention psychoanalysis), have yielded nothing by way of replicable evidence of ablation or

reinstatement. Age-regressed adults may have the subjectively compelling experience of being children again, and they may appear to behave in a childlike manner, but what we see is an imaginative reconstruction of childhood, not a reversion to the genuine article.

Despite the failure of age-regression to yield a faithful reproduction of childlike mental functioning, in principle the subjectively convincing experience of being a child again offers some promise for revivification. That is, in a manner analogous to state-dependent memory induced by changes in environmental context or emotional state, it might be that vividly imagining oneself as a child improves access to memories encoded during childhood. This is an interesting idea, but at present there is no convincing evidence for it. Only three published studies have actually attempted to corroborate the memories reported by age-regressed subjects. These all yielded results favourable to hypnosis, but they all suffer from serious methodological flaws that render their positive findings suspect (Kihlstrom & Barnhardt 1993; Kihlstrom & Eich 1994). There may be some memory enhancement produced by hypnotic age regression, but age regression is first and foremost a product of the imagination, and any accurate memory produced is likely to be blended with a great deal of false recall.

6. FORENSIC HYPNOSIS

Some proponents of hypnosis have criticized studies of the sort described here on the grounds that they test memories that are devoid of affect and personal meaning in the sterile confines of the experimental laboratory, and asserted that different results would be obtained with more lifelike materials and settings. However, this claim rests on an evidentiary base which is almost entirely anecdotal. For example, Reiser (1976), who has actively promoted the use of hypnosis by the Los Angeles Police Department, found only that investigators who have used hypnosis have generally found it to be helpful. However, such testimonials are not supported by empirical evidence that, for example, hypnosis produces more valid than false recollection.

Timm (1981) staged a mock organized-crime execution in front of an introductory criminal justice class (after first insuring that none of the police officers taking the course were actually carrying their service weapons!). After the incident, Timm informed the subjects about the ruse, and invited them to participate in an experiment on eyewitness memory. One group of subjects received a standard forensic hypnosis interview involving the induction of hypnosis, age regression to the time of the episode and visualization; another group received the same interview without hypnosis; and a third group was interviewed without any suggestive procedures at all. The results were clear: although the interview technique produced an increase in correct responses compared to the controls, chiefly by reducing the incidence of response omissions, hypnosis added nothing to the outcome.

In another study, reported by Geiselman *et al.* (1985), volunteer subjects viewed actual police training films

depicting a family dispute and robberies at a bank, liquor store and warehouse. The subjects were then interviewed by actual police investigators trained in forensic hypnosis and in a non-hypnotic 'cognitive interview' technique. Compared to a standard police interview, the cognitive interview increased the number of correct memory reports; but when hypnosis was added to the package, performance actually went down somewhat.

Similar results were obtained in the most lifelike setting imaginable: a remarkable field study, which employed as subjects actual witnesses and victims in cases then under active police investigation, and as interviewers actual police officers highly trained and experienced in forensic hypnosis techniques (Sloane 1981). With informed consent, some witnesses and victims were randomly assigned to a conventional forensic hypnosis interview involving instructions for visualization; others got the same interview without hypnosis; and others were interviewed in and out of hypnosis without visualization instructions. There were no effects of either hypnosis or visualization on either the amount of new material recalled, or on the accuracy of this new material.

Despite these negative results, police investigators still sometimes turn to hypnosis in an attempt to enhance the memories of witnesses and victims (for an update on the legal status of forensic hypnosis, see Giannelli (1995)). And, occasionally, hypnosis seems to produce results where other techniques have failed. For example in the famous Chowchilla kidnapping case, the bus driver, after being hypnotized, was able to produce five of the six characters on a car license plate which was eventually linked to the crime. But of course, we don't hear anecdotes about failures, such as the Brinks armoured car robbery in Boston, where a hypnotized eyewitness confidently produced the license plate of a car belonging to the president of Harvard University (the witness was employed at Harvard, and had often seen the president's car). The question is not whether hypnosis works to improve memory. Virtually everything works sometimes, or seems to. The question is whether hypnosis can do so reliably; and the answer to this question is, so far as we can determine, firmly in the negative.

7. HYPNOSIS IN RECOVERED MEMORY THERAPY

Still, some clinical practitioners refuse to accept the conclusions of laboratory research. Over 100 years ago, Sigmund Freud used hypnosis to elicit memories of childhood trauma from their hysterical patients, a practice that has been revived today among some proponents of what has come to be called 'recovered memory therapy' for victims of incest, sexual abuse or other forms of trauma (hypnosis has also been used clinically to recover memories of prenatal experiences and of alien abductions). This is not the place to go into the assets and liabilities of recovered memory therapy, or the trauma-memory argument on which it is based, except to point out that these contemporary clinical practitioners, like their 19th-century Viennese

forebears, rarely are able to obtain independent, objective corroboration of their patients' reports (or, for that matter, rarely even bother to seek it), and to point out that uncorroborated memory reports are useless as scientific or clinical evidence about the historical past. In fact, there is almost no evidence supporting either the validity of the trauma-memory argument or the efficacy of recovered memory therapy (for critical reviews, see Kihlstrom 1994a,b, 1995, 1996, 1997; Lindsay & Read 1994). In the absence of objective corroboration from a representative series of cases, the use of hypnosis in recovered memory therapy lacks any scientific basis (Erdelyi 1994; Kihlstrom 1994a).

In the final analysis, while it remains theoretically possible that the imaginative return to childhood might assist in the recovery of previously forgotten childhood memories, it is important to bear two points firmly in mind. First, the ability of young children to encode permanent memories of experiences is extremely limited, and there is no reason to think that hypnosis or anything else can overcome infantile and childhood amnesia. Second, hypnosis is first and foremost a state of believed-in imaginings: in the absence of independent corroboration, there is no reason to think that any hypnotically refreshed recollection is an accurate representation of the historical past, and, in fact, every reason to doubt it. A similar conclusion pertains to the use of barbiturates (Piper 1993). It is remarkable how hypnosis and barbiturate sedation have entered clinical lore as techniques for the recovery of clinically significant memories, in the absence of any scientific evidence for these beliefs.

8. WHAT HYPNOSIS CAN AND CANNOT DO TO MEMORY

Although hypnosis appears to be incapable of enhancing memory, hypnotic procedures can impair memory in at least two different ways. First, by means of suggestions for posthypnotic amnesia, hypnosis can impair explicit memory for the events and experiences that transpired during hypnosis, although, as with many other forms of amnesia, it appears to spare implicit memory. The mechanism for this amnesia appears to be a division of consciousness, such that the subject is unaware of events that would otherwise be memorable. Interestingly, hypnosis appears incapable of expanding awareness, so as to enable subjects to remember things that would otherwise remain forgotten. However, the social context of hypnosis, including widely shared (though false) beliefs about its capacity for memory enhancement (with or without age regression), and the suggestive context in which hypnosis occurs in the first place, renders the hypnotized subject vulnerable to various kinds of distortions in memory. Because the risks of distortion vastly outweigh the chances of obtaining any useful information, forensic investigators and clinical practitioners should avoid hypnosis as a technique for enhancing recollection.

I thank Terrence Barnhardt, Talia Ben-Zeev, Robert Crowder, Marilyn Dabady, Jennifer Dorfman, Eric Eich, Elizabeth Phelps, Katherine Shobe and Heidi Wenk for their comments

at various stages. The point of view represented in this paper is based on research supported by grant #MH-35856 from the National Institute of Mental Health.

REFERENCES

- Dorfman, J. & Kihlstrom, J. F. 1994 Semantic priming in posthypnotic amnesia. Paper presented at the annual meeting of the Psychonomic Society, St. Louis, November 1994.
- Dorfman, J., Kihlstrom, J. F., Cork, R. C. & Misiaszek, J. 1995 Priming and recognition in ECT-induced amnesia. *Psychonom. Bull. Rev.* **2**, 244–248.
- Dywan, J. 1988 The imagery factor in hypnotic hypermnnesia. *Int. J. Clin. Expl Hyp.* **36**, 312–326.
- Dywan, J. 1995 The illusion of familiarity: an alternative to the report-criterion account of hypnotic recall. *Int. J. Clin. Expl Hyp.* **43**, 194–211.
- Erdelyi, M. H. 1984 The recovery of unconscious (inaccessible) memories: laboratory studies of hypermnnesia. In *The psychology of learning and motivation*, vol. 18 (ed. G. H. Bower), pp. 95–127. New York: Academic Press.
- Erdelyi, M. H. 1994 Hypnotic hypermnnesia: the empty set of hypermnnesia. *Int. J. Clin. Expl Hyp.* **42**, 379–390.
- Evans, F. J. 1972 Posthypnotic amnesia and the temporary disruption of retrieval processes. Paper presented at the annual meeting of the American Psychological Association, Honolulu, Hawaii, September 1972.
- Evans, F. J. 1979 Contextual forgetting: posthypnotic source amnesia. *J. Abnorm. Psychol.* **88**, 566–573.
- Evans, F. J. & Thorn, W. A. F. 1966 Two types of posthypnotic amnesia: recall amnesia and source amnesia. *Int. J. Clin. Expl Hyp.* **14**, 333–343.
- Fromm, E. & Nash, M. R. (eds) 1992 *Contemporary hypnosis research*. New York: Guilford.
- Geiselman, R. E., Fisher, R. F., MacKinnon, D. P. & Holland, H. L. 1985 Eyewitness memory enhancement in the police interview: cognitive retrieval mnemonics versus hypnosis. *J. Appl. Psychol.* **70**, 401–412.
- Giannelli, P. C. 1995 The admissibility of hypnotic evidence in U.S. courts. *Int. J. Clin. Expl Hyp.* **43**, 212–233.
- Hilgard, E. R. 1965a Hypnosis. *A. Rev. Psychol.* **16**, 157–180.
- Hilgard, E. R. 1965b *Hypnotic susceptibility*. New York: Harcourt Brace & World.
- Hilgard, E. R. 1975 Hypnosis. *A. Rev. Psychol.* **26**, 19–44.
- Hull, C. L. 1933 *Hypnosis and suggestibility: an experimental approach*. New York: Appleton–Century–Crofts.
- Kihlstrom, J. F. 1979 Hypnosis and psychopathology: retrospect and prospect. *J. Abnorm. Psychol.* **88**, 459–473.
- Kihlstrom, J. F. 1980 Posthypnotic amnesia for recently learned material: interactions with ‘episodic’ and ‘semantic’ memory. *Cogn. Psychol.* **12**, 227–251.
- Kihlstrom, J. F. 1985a Hypnosis. *A. Rev. Psychol.* **36**, 385–418.
- Kihlstrom, J. F. 1985b Posthypnotic amnesia and the dissociation of memory. In *The psychology of learning and motivation*, vol. 19 (ed. G. H. Bower), pp. 131–178. New York: Academic Press.
- Kihlstrom, J. F. 1994a Hypnosis, delayed recall and the principles of memory. *Int. J. Clin. Expl Hyp.* **42**, 337–345.
- Kihlstrom, J. F. 1994b Exhumed memory. In *Truth in memory* (ed. S. J. Lynn & N. P. Spanos). New York: Guilford. (In the press.)
- Kihlstrom, J. F. 1995 The trauma-memory argument. *Conscious. Cogn.* **4**, 63–67.
- Kihlstrom, J. F. 1996 The trauma-memory argument and recovered memory therapy. In *The recovered memory/false memory debate* (ed. K. Pezdek & W. P. Banks), pp. 297–311. San Diego, CA: Academic.
- Kihlstrom, J. F. 1997 Suffering from reminiscences: exhumed memory, implicit memory, and the return of the repressed. In *Truth in memory* (ed. M. A. Conway), pp. 100–117. Oxford University Press.
- Kihlstrom, J. F. & Barnhardt, T. M. 1993 The self-regulation of memory, for better and for worse, with and without hypnosis. In *Handbook of mental control* (ed. D. M. Wegner & J. W. Pennebaker), pp. 88–125. Englewood Cliffs, NJ: Prentice-Hall.
- Kihlstrom, J. F. & Eich, E. 1994 Altering states of consciousness. In *Learning, remembering, and believing: enhancing performance* (ed. D. Druckman & R. A. Bjork), pp. 207–248. Washington, DC: National Academy Press.
- Kirsch, I. & Lynn, S. J. 1995 The altered state of hypnosis: changes in the theoretical landscape. *Am. Psychol.* **50**, 846–858.
- Laurence, J.-R. & Perry, C. 1983 Hypnotically created memory among highly hypnotizable subjects. *Science* **222**, 523–524.
- Lindsay, D. S. & Read, J. D. 1994 Psychotherapy and memories of childhood sexual abuse: a cognitive perspective. *Appl. Cogn. Psychol.* **8**, 281–339.
- Mandler, G. 1980 Recognizing: the judgment of prior occurrence. *Psychol. Rev.* **87**, 252–271.
- Nash, M. R. 1987 What, if anything, is regressed about hypnotic age regression? *Psychol. Bull.* **102**, 42–52.
- O’Connell, D. N., Shor, R. E. & Orne, M. T. 1970 Hypnotic age regression: an empirical and methodological analysis. *J. Abnorm. Psychol.* Monograph **76**, 1–32.
- Piper, A. 1993 ‘Truth serum’ and ‘recovered memories’ if sexual abuse: a review of the evidence. *J. Psychiat. Law* **21**, 447–471.
- Putnam, W. H. 1979 Hypnosis and distortions in eyewitness memory. *Int. J. Clin. Expl Hyp.* **27**, 437–448.
- Register, P. A. & Kihlstrom, J. F. 1987 Hypnotic effects on hypermnnesia. *Int. J. Clin. Expl Hyp.* **35**, 155–179.
- Reiff, R. & Scheerer, M. 1959 *Memory and hypnotic age regression: developmental aspects of cognitive function explored through hypnosis*. New York: International Universities Press.
- Reiser, M. 1976 Hypnosis as an aid in criminal investigation. *Police Chief* **46**, 39–40.
- Roediger, H. L. & McDermott, K. B. 1993 Implicit memory in normal human subjects. In *Handbook of neuropsychology*, vol. 8 (ed. F. Boller & J. Grafman), pp. 63–131. Amsterdam: Elsevier.
- Sarbin, T. R. & Coe, W. C. 1972 *Hypnosis: a social psychological analysis of influence communication*. New York: Holt, Rinehart & Winston.
- Schacter, D. L. 1987 Implicit memory: history and current status. *J. Expl Psychol. Learn. Mem. Cogn.* **13**, 501–518.
- Schacter, D. L. 1995 Implicit memory: a new frontier for cognitive neuroscience. In *The cognitive neurosciences* (ed. M. S. Gazzaniga), pp. 815–824. Cambridge, MA: MIT Press.
- Schacter, D. L. & Kihlstrom, J. F. 1989 Functional amnesia. In *Handbook of neuropsychology*, vol. 3 (ed. F. Boller & J. Grafman), pp. 209–231. Amsterdam: Elsevier.
- Sloane, M. C. 1981 A comparison of hypnosis vs. waking state and visual vs. non-visual recall instructions for victim/witness memory retrieval in actual major crimes. Unpublished doctoral dissertation, Florida State University. (University Microfilms International, No. 8125873.)
- Spanos, N. P., Radtke, H. L. & Dubreuil, D. L. 1982 Episodic and semantic memory in posthypnotic amnesia: a reevaluation. *J. Personality Social Psychol.* **43**, 565–573.
- Timm, H. W. 1981 The effect of forensic hypnosis techniques on eyewitness recall and recognition. *J. Police Sci. Admin.* **9**, 188–194.
- Whitehouse, W. G., Dinges, D. F., Orne, E. C. & Orne, M. T. 1988 Hypnotic hypermnnesia: enhanced memory accessibility or report bias? *J. Abnorm. Psychol.* **97**, 289–295.