Enhancing Visual Memory: The Impact of Hypnosis, Imagination, and Repeated Testing

Heather Nogrady

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ABSTRACT

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Heather Nogrady

The present study investigated the impact of hypnosis, imagination, and control conditions on visual recall memory. Using Erdelyi and Becker's (1974) waking hypermnesia design, both high and low hypnotizable individuals in each condition were given repeated tests to recall pictures that they had been shown previously. In the hypnosis condition, subjects were exposed to an induction procedure and were given suggestions for hypnotic hypermnesia and for posthypnotic hypermnesia. In the imagination condition, subjects were motivated and instructed to use imagery strategies in their recall attempts and were given explicit instructions for hypermnesia. In the control condition, subjects were given no particular instructions. Results indicated that the amount of both correct and incorrect material reported increased appreciably in all conditions with repeated recall attempts. Neither hypnosis nor imagination, however, enhanced recall beyond that of normal waking performance. Findings also indicated that whereas hypnotizability was

unrelated to the amount of correct material recalled, it was related to the number of errors reported. Not only did high hypnotizable subjects report more errors overall, but those in the hypnosis condition were also more likely than any other subjects to confidently rate incorrect material as correct. Results are discussed in terms of the impact of hypnosis on and the relevance of hypnotizability to visual memory enhancement, and comment is also made concerning their implications for the applied use of hypnosis.

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Table of Contents

	Page
Abstract	i
Acknowledgments	iii
Table of Contents	iv
List of Tables	vi
List of Figures	vii
Introduction	1
Clinical Applications of Hypnosis on Memory	4
Forensic Applications of Hypnosis on Memory	8
Empirical Research on Hypnosis and Memory	14
Major Empirical Issues	22
The Present Study	27
Method	31
Subjects	31
Apparatus and Test Materials	33
Procedure	35
Results	43
Performance on Recall Tests	43
Confidence Ratings of Total Correct and Incorrect Items	53
Postexperimental Inquiry Information	58
Discussion	61
Impact of Hypnosis	62
Hypnosis versus Hypnotic Context	63
Relevance of Hypnotizability	67
Confidence in Memory	69
Implications for Applied Hypnosis	70
Conclusions	75
References	76

Appendices 86

Appendix A: Names and Pictures of Stimuli . . . 86
Appendix B: Informed Consent Form 93
Appendix C: Puzzle. 95
Appendix D: Response Sheet. 97
Appendix E: Postexperimental Inquiry Form . . . 99
Appendix F: Verbatim Transcript of Experimental Procedure. 101
Appendix G: Raw Data. 117
Appendix H: Analysis of Variance Source Tables. 124

List of Tables

Table		Page
1.	Mean Number of Total Correct Items	45
2.	Mean Number of Total Incorrect Items	46
3.	Mean Number of Cumulative Correct Items	48
4.	Mean Number of Cumulative Incorrect Items	49
5.	Mean Proportion of Cumulative Correct Items	51
6.	Mean Proportion of Cumulative Incorrect Items	52
7.	Mean Confidence Ratings of Total Correct Items	54
8.	Mean Confidence Ratings of Total Incorrect Items	55
9.	Mean Number of Cumulative "Confident Errors"	57
10.	Mean Ratings of Helpfulness of Experimental Manipulation	60

List of Figures

Figure Page

1. Schematic of the experimental procedure 37

INTRODUCTION

The essence of hypnosis remains elusive and is subject to diverse theoretical conceptualizations. Nevertheless, it can be defined as a context in which subjects are requested to set aside critical judgment, without relinquishing it completely, and to indulge in make-believe and fantasy (Gill & Brenman, 1959; Hilgard, 1977). Moreover, the fantasy and make-believe of hypnosis may be so subjectively real that some investigators have variously described it as believed-in imaginings (Sarbin & Coe, 1972), imaginative involvement (J. Hilgard, 1970/79), and involvement in suggestion-related imaginings (Spanos & Barber, 1974). Further, the profoundly hypnotized person has also been described in nonpejorative terms as deluded (Sutcliffe, 1961).

To the extent that an individual can experience hypnosis, alterations in perception, mood, and memory can occur (Orne, 1980; Orne & Hammer, 1974; Orne & McConkey, 1982). For individuals who have a high level of hypnotizability, hypnotic suggestions can be quite effective in eliciting experiential changes. For example, if, when hypnotized, it is suggested to these individuals that their hand is becoming insensitive to pain, most will experience decreased pain when a painful stimulus is applied (e.g., McGlashen, Evans, & Orne, 1969; Nogrady, McConkey, Laurence, & Perry, 1983). If it is suggested that they will forget the

events of hypnosis, they will experience amnesia for those events (e.g., Kihlstrom & Evans, 1973; McConkey & Sheehan, 1981). Further, if it is suggested that they will become sad or happy, they will experience such changes in mood (e.g., Bower, 1981).

Research has consistently shown that there is wide variation in the responses to hypnotic suggestions in an unselected population. For instance, about 10 percent of all people have a high level of hypnotizability, about 5 percent have a very low level, and the remainder lie between these extremes (Hilgard, 1965). Moreover, level of hypnotizability appears to be relatively stable throughout a person's lifetime, and there are a number of psychometrically sophisticated measures of hypnotizability available for both clinical and experimental situations (see Hilgard, 1978/79; Sheehan & McConkey, 1982, for recent reviews of these measures). Although hypnosis typically occurs in the context of a dyadic relationship (i.e., experimenter-subject, therapist-client), and some form of induction is generally needed, it is the individual's level of hypnotizability that is the major determinant of the degree to which hypnosis is experienced (Orne & Hammer, 1974).

Since Mesmer's time, hypnosis has spanned a wide range of clinical applications, and although some results have been dramatic, its efficacy as a treatment modality is differential (Wadden & Anderton, 1982). On the one hand, the

effectiveness of hypnosis in the treatment of pain, warts, asthma, and burns has been well established; on the other hand, there has been only limited success in the treatment of socially learned behaviors such as alcoholism, smoking, and overeating. In spite of this conundrum, however, hypnosis continues to find new uses even in nonclinical fields such as sports, advertising, and education (Udolf, 1981).

In recent years, hypnosis has also been used in the criminal justice system in order to obtain leads in criminal investigations and to "refresh" the memories of witnesses and victims of crime (Reiser, 1980). This latter application has been the source of a growing controversy over whether hypnotically influenced memory should be admissible as evidence (see Carter, 1982; Diamond, 1980). A critical issue that underlies this controversy is the extent to which hypnosis may enhance memory beyond that which occurs when hypnosis is not involved. From both theoretical (see Smith, 1983) and applied (see Orne, Soskis, & Dinges, in press) perspectives, empirical clarification is needed on this issue.

Until a decade ago, clinical and forensic case material was the principal data base on which forensic experts based their decision to use hypnosis to improve memory. Since then, however, systematic research (e.g., Dywan & Bowers, 1983; Laurence & Perry, 1983a) has sought to elucidate the effects of hypnosis on memory processes in order to provide a

more scientific basis on which the courts may eventually determine the reliability of hypnotically enhanced recall. One line of inquiry that holds considerable promise in shedding light on this issue is the application of established research designs from the field of cognitive psychology to the investigation of hypnosis and memory. Accordingly, the present research used the waking hypermnesia approach (e.g., Erdelyi & Becker, 1974) as the guiding framework in which to explore the possible hypnotic enhancement of visual memory. In this context, hypermnesia refers to the pattern of incremental recall that occurs with repeated tests.

Across the research that has been conducted to date, the wide range of conceptual and methodological approaches has resulted in an equally wide range of conflicting data concerning the effects of hypnosis on memory. In order to appreciate the extent of the conflict that currently surrounds the debate concerning hypnosis and memory, evidence from the clinical, forensic, and research areas will be reviewed.

Clinical Applications of Hypnosis on Memory

Because of the therapeutic gain sometimes obtained when hypnosis is used to enhance memory for clinically meaningful events (e.g., Freud, 1905; Kolb, 1982), it is widely believed that hypnosis enables individuals to recover previously

unavailable memories. For instance, Freud's (1905; Freud & Breuer, 1895) patients typically experienced compelling emotional reactions while remembering traumatic childhood events during hypnosis of which they apparently had not been aware previously. Further, these patients reported on their experiences in such a detailed fashion that many considered the "remembered" or "relived" events to be entirely accurate, especially since they subsequently experienced relief from their psychological problems.

Although these observations were used in the formulation of the early views on the sexual etiology of hysteria (Freud & Breuer, 1895), it became apparent that what patients "remembered" was a mixture of veridical memories and fantasized material (Freud, 1905). Since then, psychoanalytic theory has recognized the lack of historical accuracy of hypnotically influenced memories (Ellenberger, 1970). In this respect, it is important to note that historical accuracy is largely irrelevant when hypnosis is used to enhance clinically meaningful memories, and that therapeutic gain is not an index of the historical accuracy of "remembered" material.

Remembered material need only serve the patient's psychological requirements and need not be factual for therapeutic success. Indeed, Janet (1889) used hypnosis intentionally to alter patients' memories in order to achieve psychological relief. In addition, investigators of this

period (e.g., Bannister, 1895, Bernheim, 1888; Janet, 1889) noted that intentional or unintentional alterations of memory could occur as a result of hypnotically influenced memory. Consequently, they cautioned against belief in the historical accuracy of such memory even if that memory was believed in by the individual. Further, Bernheim (1888) considered the memories of highly hypnotizable individuals to be prone to alteration even when hypnosis was not involved due to the propensity of these individuals to become involved in their "believed-in imaginings" (Sarbin & Coe, 1972) or their suggestion-related imaginings (Spanos & Barber, 1974).

More recent clinical applications of hypnosis to enhance memory have indicated that hypnosis is sometimes useful and sometimes not useful in assisting the retrieval of unavailable material. Although some contemporary case studies (e.g., Fromm, 1970; Raginsky, 1969) have provided dramatic examples of the potential impact of hypnosis on memory, it is unclear whether the use of hypnosis in these cases was necessary for information retrieval or merely incidental to it (Perry & Laurence, 1983b). For instance, Raginsky (1969) described the use of hypnosis with an airline pilot who could not recall the final moments before a crash. During hypnosis, he recalled that just before crashing, he was concentrating so intensely on a new altimeter, on which he had been recently trained, that he adopted the flight pattern of the training airport. Since the airport that he

was approaching, however, had a different landing pattern, he crashed. The pilot's hypnotically influenced recall later led to the recovery of important physical evidence that corroborated the information obtained in hypnosis.

In another case report, Fromm (1970) documented the case of a Japanese American who believed that he did not speak Japanese. When hypnotically age regressed, however, he spontaneously began to speak Japanese. Fromm (1970) determined that for the first four years of his life this individual had lived in a Japanese-speaking relocation camp during World War II. Following this period of internment, he was then immersed in an English-speaking environment and, for reasons unknown, lost any memory of both the experience and the Japanese language. Although the recovery of a discarded childhood language is compelling in this case, other cases (e.g., As, 1962; Kihlstrom, 1978; Marks, 1981) have reported that hypnosis offered only limited assistance in attempts to recover lost childhood languages.

In summary of the clinical material concerning hypnosis and memory, it appears that hypnosis may either have no particular effect (e.g., Kihlstrom, 1978), may enhance accurate recall (e.g., Raginsky, 1969), or may enhance both accurate and inaccurate recall (e.g., Freud, 1905). Further, no systematic research has been conducted on the hypnotic enhancement of recall in the clinical context, and much of the information that suggests positive effects of hypnosis on

clinical material is anecdotal and impressionistic at best. It should also be noted that although some individuals (e.g., Reiser, 1980) argue that therapeutic gain and/or a person's confidence in the accuracy of hypnotically influenced memory are reliable indices of the veridicality of remembered events, the fact that intentionally altered memories (e.g., Janet, 1889) may also lead to therapeutic success and may also be held with great confidence underscores the untenability of such a position.

Forensic Applications of Hypnosis on Memory

The forensic application of hypnosis to enhance memory was popular in the late 19th century (see Laurence & Perry, 1983b, for a review). Specifically, during this period when Freud (1905) and Janet (1889) were using hypnosis as a clinical technique, others were using it to refresh the memory of witnesses and victims of crime. The clinical observations as well as some experimental work (e.g., Bernheim, 1888) of the time, however, prompted several investigators (e.g., Bannister, 1895; Bernheim, 1891; Binet & Fere, 1888) to caution against such investigative uses. In particular, they pointed out that an individual's memory could be changed easily through hypnosis and that such individuals, believing in the accuracy of their recall, would subsequently give "false testimony in good faith" (Bernheim,

1891, p. 92).

In one court case of the time, a young woman had apparently forgotten the event that had caused her pregnancy. Following the birth of her child, she was hypnotized and "remembered" that she had been raped by a male friend some nine months earlier. The friend was charged with rape, but the court decided that although a sexual event must have occurred, that the accused may have been involved, and that rape may have been commited, there was no evidence to corroborate the accuracy of the woman's hypnotically influenced memory. The court stressed that the woman's memory may have been either simulated (i.e., an intentionally inaccurate report), confabulated (i.e., a believed-in inaccurate report), or entirely accurate; but without the necessary corroborating evidence to decide among these alternatives, the young man was acquitted (see Morand, 1889). Thus, the major issues concerning hypnotically refreshed memory that were debated by expert witnesses before the courts in the late 19th century were simulated memory, confabulated memory, and suggested memory. Interestingly, these are the same major issues being debated at the present time in North American courts (e.g., Carter, 1982; Diamond, 1980; Orne et al., in press; Reiser, 1980; Ruffra, 1983).

The nature of hypnotically influenced memory was first raised in North America in People v. Ebanks (1897). This case focused on whether hypnosis had "truth serum" qualities

(see also People v. McNicol, 1950). Specifically, the defendant was hypnotized and "recalled" information that indicated his innocence. The court ruled, however, that individuals are more likely to make errors in memory during hypnosis than they would in other situations, and ruled that information obtained during hypnosis was not admissible as evidence. Following that decision, investigative hypnosis was virtually abandoned in the United States for several decades.

While some individuals (e.g., Arons, 1967; Bryan, 1962) have advocated the use of hypnosis in criminal investigations for a number of years, most of the renewed interest in hypnosis in this context stems from the training of law enforcement officers in "investigative hypnosis" by the Los Angeles Police Department. This program follows the techniques of Reiser (1980; see Perry & Laurence, 1982, for a review) who conducts a "comprehensive program of four days, consisting of 32 class hours of theory, demonstration, and practice" (Reiser, 1980, p. xvi). It is currently estimated that over 5000 law enforcement officers have been trained in these techniques throughout North America in the last ten years (Orne et al., in press).

Surveys of the forensic use of hypnosis to enhance memory (e.g., Reiser, 1980; Stratton, 1977) have reported the successful generation of new leads in up to 90 percent of cases, a record that implies a facilitation of recall

effects. In addition, a number of case summaries (e.g., Kroger & Douce, 1979; Reiser, 1980; Schafer & Rubio, 1978) have documented the apparent utility of hypnosis in criminal investigations. For instance, Schafer and Rubio (1978) reported that hypnosis was useful in enhancing the recall of witnesses or victims in 10 out of 13 cases. Similarly, Kroger and Douce (1979) reported that hypnosis enhanced memory in over 60 percent of the cases they reviewed. Although such information appears to endorse hypnotic enhancement techniques, it does not necessarily reflect the accuracy of the material reported; rather, it tends to reflect the perceptions of those employing the procedures (Timm, 1982; Orne et al., in press). Thus, just as therapeutic benefit provides no information about the accuracy of clinically relevant memories, perceived benefit provides no information about the accuracy of criminally relevant memories.

Considerable legal debate concerning the extent to which hypnosis either enhances or interferes with memory has also occurred in recent years (see Carter, 1982; Diamond, 1980; Orne, 1979, Orne et al., in press). Some courts (e.g., Kline v. Ford Motor Company, Inc., 1975; State v. Jorgensen, 1971; State v. McQueen, 1978; U.S. v. Adams et al., 1978) have followed the decision of Harding v. State (1968) to allow testimony based upon hypnotically influenced memory but with the jury being cautioned that hypnotically based testimony

may not be factual and should not be given more credibility than any other testimony. Other courts (e.g., Collins v. State, 1982; Commonwealth v. Nazarovitch, 1981; People v. Shirley, 1982; State v. Mena, 1981; State v. Palmer, 1981; Strong v. State, 1982) have followed the decision of State v. Maek (1980) that ruled that the testimony of a witness whose memory was enhanced through hypnosis is not admissible as evidence.

When hypnotically influenced memory has not been admitted as testimony, courts have generally invoked the Frye rule as the basis of that decision. Frye v. U.S. (1932) concerned the use of the polygraph as a detector of deception, and the court ruled that a procedure used to obtain evidence must demonstrate general acceptance within the scientific community that employs that procedure. Following this ruling, Collins v. State (1982) concluded that "the use of hypnosis to restore or refresh the memory of a witness is not accepted as reliable by the scientific community and that such testimony is therefore inadmissible" (pp. 20 - 21). In addition, the Collins court argued that it was permissible for hypnosis to be used to obtain investigative leads, provided that independent verification of hypnotically elicited material was also obtained. Thus, application of the Frye criterion has highlighted not only the debate that exists within the scientific community concerning hypnosis and memory, but also the relative lack of

systematic research on this issue.

Other courts (e.g., Collins v. Superior Court of the State of Arizona, 1982) have ruled that "matters that the witness was able to recall and relate prior to hypnosis" (p. 2157) are admissible as evidence, whereas material that only became available during hypnosis is inadmissible. It is important to note, however, that memories recalled prior to, during, and following hypnosis may not be easily distinguishable (Orne et al., in press). Although relatively little research has been conducted on this issue, findings from studies on hypnotically created memories (e.g., Bernheim, 1888; Laurence & Perry, 1983a; Orne, 1979) suggest that such a distinction can be difficult to make for some individuals. For this and other reasons, Orne (1979) has proposed a series of guidelines for the investigative use of hypnosis (see Orne et al., in press, for an enlarged and updated version of these guidelines). These guidelines have been adopted by the Federal Bureau of Investigation (Ault, 1979), as well as by a number of United State Supreme Courts (e.g., Collins v. State, 1982; People v. Shirley, 1982; State v. Hurd, 1981). While such guidelines are designed to minimize cueing or leading a witness, it is important to note that they do not guarantee the reliability of hypnotically refreshed recall. Moreover, in order for these guidelines to be appreciated, information is needed about the circumstances under which hypnosis either has no effect, a negative effect,

or a positive effect on memory. These are issues that must be considered in terms of the data provided by empirical research.

Empirical Research on Hypnosis and Memory

The studies conducted on the hypnotic enhancement of memory have varied widely in their conceptual and methodological sophistication. Typically, however, they have compared the impact of hypnosis with that of a waking procedure and have used stimulus materials that are quantifiable and therefore allow the documentation of any changes that may occur when hypnosis is employed. Across the range of empirical studies that have examined the impact of hypnosis on memory enhancement, findings have variously indicated no effect, a negative effect, or a positive effect of hypnosis. In order to evaluate these variable results, an examination of the research relating to each of these outcomes is warranted.

No Effect of Hypnosis on Memory

One consistent finding among studies investigating the effect of hypnotic memory enhancement, is that if the stimulus material is not meaningful, hypnosis does not add anything to either waking recall or to recognition memory (Orne et al., in press; Weitzenhoffer, 1955). The majority of

studies (e.g., Barber & Calverley, 1966; Dhanens & Lundy, 1975; Eysenck, 1941; Huse, 1930; Mitchell, 1932; Rosenhan & London, 1963) that have used nonsense syllables as stimuli have reported no appreciable impact of hypnosis. Similarly, studies that have used unconnected word lists or paired associate procedures (e.g., Das, 1961; Rosenthal, 1944; Salzberg & DePiano, 1980; Young, 1925) have not found any improvement in recall when hypnosis was introduced. For instance, Huse (1930) paired nonsense syllables and symbols and tested subjects in both hypnosis and wake state. Her findings indicated no difference between hypnotic and waking recall. Similarly, Mitchell (1932) used nonsense syllables and also found no difference between hypnotic and waking recall. Barber and Calverly (1966) also reported no advantage of hypnosis in the recall of nonsense syllables learned two months earlier. In fact, they found no differences in memory related to type of suggestion, hypnotic condition, or to any interaction. Dhanens and Lundy (1975) later confirmed these results.

One exception to this trend of finding no effect of hypnosis on memory for meaningless material was recently reported by Shields and Knox (1983), and is the only study to date to have analyzed the data in terms of hypnotizability. These investigators found that extensive processing of meaningless bigrams at the time of encoding led to superior recall by high hypnotizable subjects tested in hypnosis

compared to that of high hypnotizable subjects tested in a relaxation condition or to low susceptible simulators. It is important to note, however, that the cognitive elaboration of the bigrams rendered them meaningful, thus highlighting the role of stimulus salience in hypnotically enhanced memory.

Although Augustynek (1978, 1979) reported that hypnosis improved the recall of both meaningful and meaningless material in the same study, other investigators have generally reported a positive effect of hypnosis on memory only for meaningful material when both meaningful and meaningless stimuli were employed in the same study (e.g., Dhanens & Lundy, 1975; Rosenthal, 1944; White, Fox, & Harris, 1940; Young, 1925). For example, Young (1925) reported no improvement in the recall of adjective noun associates when hypnosis was used, but did find improvement in the recall of childhood experiences. Similarly, White et al. (1940) reported that hypnosis improved the recall of pictures and poetry, but did not improve the recall of nonsense syllables. White et al. (1940) speculated that memory can be improved by hypnosis only to the extent that it provides the opportunity for the active reconstruction of past experiences out of the schemata (Bartlett, 1932) that are available to waking memory, and supported this speculation through the subjective reports of individuals who reflected that during hypnosis, poetry "seemed to flow together nicely" (p. 101); that is, the material seemed to undergo spontaneous

reconstruction while subjects remained relatively passive in their attempts to remember. In similar fashion, Rosenthal (1944) showed the differential impact of hypnosis on memory for meaningful and nonsense material, and Dhanens and Lundy (1975) also observed the same effect for biographical and prose material compared to nonsense syllables. In this context, it is useful to note that the absence of a hypnotic effect for meaningless material indicates that hypnosis does not serve to reactivate memory traces of the to-be-remembered material (Orne et al., in press) as some proponents of investigative hypnosis (e.g., Reiser, 1980) argue; clearly, if there were such an effect, there would be no differences in the recall of meaningful and meaningless material.

Negative Effects of Hypnosis on Memory

Apart from the findings that indicate no enhancement effect of hypnosis on memory, there are also findings that indicate that the use of hypnosis may have a negative effect on memory. This negative effect may occur as a result of either interference (e.g., McConkey & Nogrady, 1983; Wagstaff, Traverse, & Milner, 1982), the incorporation into memory of misleading information (e.g., Putnam, 1979; Sheehan & Tilden, 1983; Zelig & Beidleman, 1981), or the inordinate degree of certainty in hypnotic memories, irrespective of accuracy, that hypnosis may induce (e.g., Putnam, 1979; Sheehan & Tilden, 1983; Timm, 1981, 1982; Zelig & Beidleman, 1981).

In terms of hypnotic interference with memory, Wagstaff et al. (1982) employed a forced choice recognition procedure in an eyewitness identification task and found that subjects tested in the hypnosis condition had a somewhat poorer memory performance than those tested in the wake condition. Similarly, McConkey and Nogrady (1983) employed a picture recognition procedure and found poorer memory performance by subjects tested in the hypnosis condition than by those tested in the wake condition. At least for recognition memory, then, it seems that hypnosis may interfere with, rather than enhance, subjects' memory performance.

In terms of the tendency to incorporate misleading information into memory when hypnosis is used, a number of studies (e.g., Putnam, 1979; Sheehan & Tilden, 1983; Zelig & Beidleman; 1981) based on contemporary research in eyewitness memory (e.g., Loftus, 1979) have addressed the possibility that hypnosis may actually increase distortions in memory by causing subjects to engage in greater constructive processing than normal waking procedures. In these studies, the impact of misleading questions and misinformation on subjects' hypnotic and waking recall was examined. Putnam (1979), for example, showed subjects a videotape of an accident, then tested them using neutral and misleading questions in either hypnosis or wake conditions. Findings indicated that hypnotic subjects were more likely to follow the misleading questions than waking subjects. In a replication and

extension of Putnam's (1979) study, Zelig and Beidleman (1981) used more affect-laden stimulus material, and also found that hypnotic subjects were more prone to follow misleading questions than waking subjects. It is important to note, however, that neither of these studies found any difference between hypnosis and wake conditions in terms of subjects' responses to the neutral questions. Sheehan and Tilden (1983) also reported that both hypnotic and wake subjects incorporated misleading information into memory to a similar degree. For memory that was not influenced by the misinformation, however, findings indicated that high, rather than low, hypnotizable subjects tended to generate more incorrect responses. Further, the recognition data of Sheehan and Tilden (1983) are consistent with other recognition data (e.g., McConkey & Nogrady, 1983; Redston & Knox, 1983; Wagstaff, 1982; Wagstaff et al., 1982) supporting no enhancement effect of hypnosis on memory.

In terms of the certainty of subjects' responses that hypnosis may induce, Sheehan and Tilden (1983) reported that subjects tested in hypnosis, and especially high hypnotizable subjects tested in hypnosis, were appreciably more confident of their responses than subjects tested in a wake condition; importantly, however, this increased confidence was not associated with increased accuracy. By contrast, Putnam (1979) and Zelig and Beidleman (1981) reported that confidence ratings were similar for subjects tested in the

hypnosis and wake conditions; notably, however, there were appreciably more inaccurate responses in the hypnosis condition. That is, subjects tested in hypnosis were just as confident, although less accurate, than subjects tested in the wake state. Similarly, Timm (1981, 1982) reported that subjects tested in hypnosis were more confident that their inaccurate responses were accurate than those subjects tested in wake conditions. Across these studies, the finding that hypnosis made subjects more confident of their memories regardless of the respective accuracy, has important implications for the use of hypnosis in forensic settings. In particular, the apparent confidence of witnesses in their memories is critical, since juries tend to be strongly influenced by adamantly confident recollections (Wells, Lindsay, & Ferguson, 1979).

Positive Effects of Hypnosis on Memory

A number of studies that have used meaningful material (e.g., DePiano & Salzberg, 1981, Dhanens & Lundy, 1975; Gheorghiu, 1972; Sears, 1954; Stalnaker & Riddle, 1932; White et al., 1940) have reported an appreciable impact of hypnosis on memory although some have not (e.g., Sheehan & Tilden, 1983). White et al. (1940), for example, showed that hypnotic suggestions led to a substantial improvement in memory for poetry and moving picture scenes compared to that of waking suggestions. Similarly, Stalnaker and Riddle (1932) requested subjects in either hypnosis or wake

conditions to recall prose and poetry learned at least one year previously. Findings indicated that hypnosis produced an appreciable improvement in recall over that achieved in the wake condition. On the other hand, Stalnaker and Riddle (1932) also found that subjects appeared to produce a substantial amount of inaccurate material which was superficially similar to the accurate version. Although this study did not provide any quantitative data, it pointed to the possibility that hypnosis may lead to an increase in the recall of both accurate and inaccurate material.

In a later study, Sears (1954) provided compelling support of hypnotically enhanced recall of an array of items compared to that of waking recall. Sears' methodology, however, may have erroneously influenced the outcome due to the fact that the waking recall always preceded the hypnotic test. Thus, it cannot be determined whether improved recall in this study was due to hypnosis or to the benefits of a second attempt. In fact, when the order of waking and hypnotic recall was counterbalanced, Cooper and London (1972) found no advantage of hypnosis, although they did observe a significant increase in memory on the second recall trial.

In other studies, hypnosis has been compared to motivating instructions and found to be more effective. DePiano and Salzberg (1981), for example, tested the recall of incidentally learned information in either hypnosis or task-motivating conditions and reported significantly better

recall by the hypnosis group. Similarly, Dhanens and Lundy (1975) administered motivating and hypnotic suggestions to recall a prose passage with and without a hypnotic induction to high and low hypnotizable subjects. While they found a superior recall effect for hypnosis, this was true only for high hypnotizable subjects when hypnosis was paired with motivating instructions. By contrast, at least one study that compared the effect of hypnosis and motivating instructions on the recall of meaningful material (e.g., Cooper & London, 1972) found no advantage of hypnosis.

To summarize, the research conducted on the effects of hypnosis on memory are widely divergent, ranging from no effect (e.g., Barber & Calverley, 1966) or even negative effects (e.g., Putnam, 1979), to positive effects (e.g., DePiano & Salzberg, 1981). This observed variability therefore merits examination in terms of the empirical issues that may underlie these mixed results.

Major Empirical Issues

It is difficult to determine whether the variation observed across the studies reported is the result of something inherent in the interaction between hypnosis and memory, or is the result of factors such as the different stimulus material used, the different levels of hypnotizability of the subjects tested, the different

hypnotic induction procedures and different enhancement suggestions used, or the different types of responses requested from subjects. In fact, one of the major criticisms that can be leveled against contemporary research on hypnosis and memory is that the majority of studies have not been guided by either the theoretical perspectives or the methodological procedures that guide much of the nonhypnotic research on memory.

As Sheehan & McConkey (1982) point out, hypnosis researchers are only just beginning to merge their methodologies and findings with those from other areas of contemporary psychology. Thus, it is argued here that any investigation of the effect of hypnosis on memory should adopt rigorous established procedures from nonhypnotic investigations of memory as its conceptual and empirical baseline. In fact, such an approach would appear to be necessary if research on hypnosis and memory is to meet the criterion of scientific convergence required by the Frye rule, as well as the explicit demands of expert witnesses in recent court cases (e.g., People v. Shirley, 1982).

The waking hypermnesia design (Erdelyi & Becker, 1974) is one approach that provides a context in which any apparent enhancement effects of hypnosis can be rigorously tested (Orne et al., in press). Although the phenomenon of hypermnesia has long been acknowledged in the literature (e.g., Ballard, 1913; Freud & Breuer, 1895; Hull, 1933), it

has been subjected to careful analysis only since the work of Erdelyi and Becker (1974). In this latter study, subjects were shown 40 concrete nouns and 40 pictures and then administered three successive 7-minute recall tests. Findings indicated that the net picture recall increased across successive tests, whereas the net word recall did not. More recently, Roediger and Payne (1982) presented 60 pictures to subjects who subsequently received three recall tests. The first recall test was delayed for varying periods of time, a design that did not confound number of tests with increasing delay. Results indicated that enhanced recall (i.e., hypermnesia) was directly related to the number of prior tests, each of which contributed to the improved performance on later tests.

Across a large number of studies (e.g., Erdelyi & Becker, 1974; Erdelyi, Finkelstein, Herrell, Miller, & Thomas, 1976; Shapiro & Erdelyi, 1974), findings generally indicate that recall progressively increases with time over successive recall attempts, although it is neither the mere passage of time (e.g., Erdelyi & Kleinbard, 1978; Roediger & Payne, 1982), nor repeated testing (e.g., Erdelyi, & Becker, 1974; Erdelyi & Kleinbard, 1978; Roediger & Thorpe, 1978; Shapiro & Erdelyi, 1974) that leads to the hypermnesia. Instead, it appears to be the retrieval effort involved that produces the effect (Erdelyi, 1982).

Despite the relevance of this approach, only one study

to date (Dywan & Bowers, 1983) has used this design to investigate the hypnotic enhancement of memory. Dywan and Bowers (1983) followed the general procedures of Erdelyi and Kleinbard (1978) and presented subjects with 60 pictures, then gave subjects a recall sheet with 60 spaces, and requested them to complete all 60 spaces, indicating which were memories and which were guesses. Subjects were given three such tests in the laboratory and then did similar tests at home once a day for six days. They then returned to the laboratory and were exposed to either a hypnotic induction procedure or task motivating instructions prior to undergoing three more recall tests. Findings indicated that hypnotic subjects reported more correct new items on the last three tests than task motivated subjects. Importantly, however, hypnotic subjects also reported more than twice as many incorrect items. In addition, they found that high hypnotizable subjects were more likely to generate incorrect items, especially when they were tested in the hypnosis condition. Overall, then, Dywan and Bowers (1983) indicated that hypnosis led to an increase in the amount of both correct and incorrect material, as Stalnaker and Riddle (1932) had originally reported. Moreover, Dywan and Bowers (1983) found that this effect was especially pronounced for high hypnotizable subjects tested in hypnosis.

The Dywan and Bowers (1983) study represents a valuable attempt to investigate the hypnotic enhancement of memory

within the hypermnesia design, but a number of criticisms concerning the subjects employed and the procedures adopted can be raised. For instance, in terms of the subjects employed, Dywan and Bowers (1983) selected high and low hypnotizable subjects on the basis of a group adaptation of an individual ypnosis scale (Weitzenhoffer & Hilgard, 1962), and defined high and low hypnotizable subjects on the basis of a median split on the 12-point scale. Although group testing of subjects is considered to be a useful initial selection device, it is generally argued that high and low hypnotizable subjects should be selected on the basis of their performance on an individually administered scale, and should be restricted to those scoring at the extreme points of the scale, rather than on the basis of a median split (Sheehan & McConkey, 1982).

In terms of the procedures adopted, Dywan and Bowers (1983) used the forced recall procedure employed in some hypermnesia studies (e.g., Erdelyi & Becker, 1974; Erdelyi & Kleinbard, 1978) that requires a fixed number of nonrepeating responses in each recall test. For instance, Erdelyi and Becker (1974) showed subjects 80 pictured items and required 40 non-repeating responses as the required response set for each recall test. The size of the response set was designed to allow for increases in correct items to occur over tests without forcing subjects to generate high numbers of potentially interfering incorrect items. Following Erdelyi

and Kleinbard (1978), Dywan and Bowers (1983) used a stimulus set of 60 items and required 60 nonrepeating responses for each recall test; thus, this procedure may have forced subjects to generate high numbers of potentially interfering incorrect items. Correspondingly, Dywan and Bowers (1983) reported that, across tests, both the number of correct and the number of incorrect responses increased. This finding may have occurred because subjects were incorporating guesses made on earlier tests into memory and generating them as actual memories on later tests. Since research has indicated that performance on later tests depends on performance on earlier tests for correct responses (Roediger & Payne, 1982), it is likely that performance on later tests also depends on earlier tests for incorrect material. Thus, since the forced recall procedure is not necessary for hypermnesia (Roediger & Payne, 1982; Roediger et al., 1982), subjects should not be forced to generate material that they know is incorrect. In view of these considerations, the present study adopted the procedures of the waking hypermnesia design developed by Erdelyi and Becker (1974), and refined by Roediger and Payne (1982), as the framework from which to investigate the hypnotic enhancement of memory.

The Present Study

The present study employed a 3 x 2 x 6 (Test Condition x

Subject Grouping x Recall Test) mixed-model design. Hypnosis, imagination, and control (i.e., wake) groups constituted the three test conditions. The hypnosis condition addressed the question of whether hypnosis and posthypnotic suggestion for increased recall influenced the recall of the stimulus material compared to the other two conditions. The imagination condition was designed to parallel the hypnosis condition in terms of the contextual demands, and to provide subjects with an imagination strategy that was nevertheless nonhypnotic. This condition addressed the question of whether hypnosis influenced recall any differently from a motivated imagination approach. Finally, the control condition provided the necessary comparison group against which both hypnosis and imagination performance could be compared (Orne et al., in press).

High and low hypnotizable subjects were employed in the study. Whereas high hypnotizable subjects are the only ones who can experience hypnosis at its most profound levels, low hypnotizable subjects often have vivid imagery (Perry, 1973) and are typically motivated by the demands of the hypnotic context. Thus, the use of high and low hypnotizable subjects in each of the three conditions permits inferences to be drawn about trait x situation interactions that may occur in terms of memory performance.

Since pilot work indicated that subjects reached asymptotic recall performance by the sixth recall attempt,

six recall tests were used. Since the present study was not concerned with any impact of retention interval, a brief retention interval that allowed for any recency effects to dissipate (see Roediger & Payne, 1982) was chosen. In contrast to the forced recall procedure employed by Erdelyi and Kleinbard (1978) and Dywan & Bowers (1983), the present study employed a free recall procedure paralleling that of Roediger and Payne (1982). Such a procedure does not force subjects to generate responses that they know are incorrect as did the procedure used by Dywan and Bowers (1983); thus, the potential artifactual influence of forcing subjects to incorporate incorrect material into memory was avoided. Instead, the procedure allowed free recall and requested that subjects rate the confidence of their responses, thus permitting analysis of the extent to which subjects could differentiate correct and incorrect responses.

To summarize, the present study employed the waking hypermnesia design in order to test the impact over time of both hypnosis and imagination instructions on visual memory compared to that of normal waking recall. In the study, both high and low hypnotizable subjects in either hypnosis, imagination, or control conditions were given repeated tests to recall pictures that they had been shown previously. In the hypnosis condition, subjects were exposed to an induction procedure and were given suggestions for hypnotic hypermnesia and posthypnotic hypermnesia; in the imagination condition,

subjects were motivated and instructed to use imagery strategies in their recall attempts; and, in the control condition, subjects were given no particular instructions. The major aim of the experiment was to explore, in a somewhat heuristic fashion, the impact of hypnosis, imagination, and control conditions on the correct and incorrect material produced by the high and low hypnotizable subjects during their repeated recall attempts. In addition, the study examined the confidence with which subjects reported their responses.

METHOD

Subjects

Subject Selection

In order to obtain the high and low hypnotizable subjects required for the present study, a two-phase selection procedure was conducted. In the first phase, 245 undergraduate students were recruited through classroom announcements and through advertisements on noticeboards and in campus newspapers which sought individuals to participate in group hypnosis sessions. In these sessions, subjects were administered the Harvard Group Scale of Hypnotic Susceptibility, Form A (HGSHS:A), of Shor and E. Orne (1962) in its standardized tape-recorded group testing format. The HGSHS:A is the most widely used group hypnosis test scale employed (Sheehan & McConkey, 1982), and there are substantial normative (e.g., Laurence & Perry, 1982; Sheehan & McConkey, 1979) and psychometric (e.g., McConkey, Sheehan, & Law, 1980) data available on it. Subjects received $4.00 for their participation in the HGSHS:A session. Subjects who scored in the high (i.e., 9-12) or low (i.e., 0-3) ranges of the 12-point HGSHS:A were invited to participate in the second phase of the selection procedure.

In the second phase, 55 subjects were administered the Stanford Hypnotic Susceptibility Scale, Form C (SHSS:C), of

Weitzenhoffer and Hilgard (1962) in its standardized individual testing format. The SHSS:C is the most widely accepted individual hypnosis test scale employed (Sheehan & McConkey, 1982), and there are substantial normative (e.g., Weitzenhoffer & Hilgard, 1962) and psychometric (e.g., Curran & Gibson, 1974) data available on it. Subjects received $8.00 for their participation in the SHSS:C session. Subjects who again scored in the high (i.e., 9-12) or low (i.e., 0-3) ranges of the 12-point SHSS:C scale were invited to participate in the present study.

Subject Characteristics

From the selection procedure, 48 subjects participated in the present study. They included 24 (9 male and 15 female) high hypnotizable subjects of mean age 25.00 years (SD = 7.94) and 24 (9 male and 15 female) low hypnotizable subjects of mean age 23.83 years (SD = 6.07). On both of the selection instruments, all high hypnotizable subjects had scored in the range 9-12 (HGSHS:A, M = 10.46, SD = .98; SHSS:C, M = 10.71, SD = .81) and all low hypnotizable subjects had scored in the range 0-3 (HGSHS:A, M = .88, SD = 1.03; SHSS:C, M = 1.17, SD = 1.09).

Test Condition Allocation

Eight high and 8 low hypnotizable subjects were quasi-randomly allocated to each of the three test conditions. Guidelines for test condition allocation were

(a) that the proportion of male to female subjects be equal across all cells, in order to balance possible sex differences, and (b) that the mean level of hypnotizability be similar across the three test conditions for the high and the low hypotizable subjects, in order to balance the effect of hypnotizability. Both of the guidelines were met such that (a) 3 male and 5 female subjects were tested in each cell, and (b) the hypnotizability scores on the HGSHS:A and the SHSS:C for the high hypnotizable subjects tested in the hypnosis (HGSHS:A, M = 10.13, SD = .99; SHSS:C, M = 11.00, SD = .76), imagination (HGSHS:A, M = 10.63, SD = 1.07; SHSS:C, M = 10.75, SD = .89), and control (HGSHS:A, M = 10.63, SD = .92; SHSS:C, M = 10.38, SD = .74) conditions were not significantly different. Similarly, the hypnotizability scores for the low hypnotizable subjects tested in the hypnosis (HGSHS:A, M = .75, SD = 1.17; SHSS:C, M = 1.50, SD = 1.41), imagination (HGSHS:A, M = 1.13, SD = .99; SHSS:C, M = 1.25, SD = .71), and control (HGSHS:A, M = .75, SD = 1.04; SHSS:C, M = .75, SD = 1.04) conditions were not significantly different.

Apparatus and Test Materials

Stimuli

Sixty 35 mm slides of black and white line drawings of common items that were randomly selected from a subset of the

standardized set of Snodgrass and Vanderwart (1980) were used as stimuli. These stimuli are widely used in memory research (e.g., Snodgrass & Burns, 1978) and have also been used in hypnosis and memory research (e.g., Dywan & Bowers, 1983). Further, these picture materials are also known to be the type of stimuli appropriate for investigating hypermnesia (e.g., Erdelyi & Becker, 1974).

In order to standardize the stimuli and the extent to which subjects were familiar with the items depicted, the subset consisted of pictures of above-average image agreement and above-average familiarity according to the norms provided by Snodgrass and Vanderwart (1980); see Appendix A for the names and pictures of the stimuli. The slides were presented to subjects at the rate of 1 every 5 seconds since this is a standard procedure in both waking (e.g., Roediger & Payne, 1982) and hypnotic hypermnesia (e.g., Dywan & Bowers, 1983) research.

Apparatus

A Kodak Carousel 800 projector with a Kodak Projection Zoom Ektanar Lens (4-6 in.; f:3.5) and an automatic timer (set at a projection rate of 1 slide per 5 seconds) was used to project the stimuli onto a blank 70 x 90 cm projection area that was 2.8 m in front of the subject who was seated in a comfortable high-backed chair.

Other Materials

At the beginning of the session, subjects signed an informed consent form (see Appendix B). An L-shaped geometric puzzle (Snodgrass & Burns, 1978) that had to be divided into four equal parts was represented as the "imagination enhancement" technique in the imagination condition and as the distraction task in the control condition (see Appendix C). During the recall tests, subjects wrote their responses on a test sheet that had spaces for 60 items with a rating scale (1, 2, 3) alongside each space (see Appendix D). At the end of the session, the experimenter conducted a postexperimental inquiry and recorded subjects' comments on a postexperimental inquiry form (see Appendix E).

Procedure

Prior to the experimental procedure, subjects read and signed an informed consent form. All subjects were tested individually by the author during a single session that lasted approximately 90 minutes. The experiment consisted of an initial study period during which the stimuli were presented, and three test periods during which recall was tested twice per period. A schematic of the experimental procedure is presented in Figure 1. (See Appendix F for a verbatim transcript of the experimental procedure).

Study Period

In the study period, all subjects were treated identically. Initially, subjects were told that they would be shown a series of 60 slides at the rate of 1 every 5 seconds, and that they should study each slide carefully because their memory for the pictures would be tested following the presentation. Subjects were told specifically that their task would be to recall the names of the pictured items. They were also advised that they could recall the names in either English or French. Following these instructions, the slides were presented.

Period 1

In Period 1, all subjects were again instructed in an identical way. After viewing the slides, subjects were given a response sheet. They were informed that their task was to write down the names of as many of the pictures as they could recall, and to indicate for each whether they were unsure (1), sure (2), or very sure (3) that the recalled items had appeared in the series of slides that they had just seen. Subjects were informed that they would have 7 minutes for the recall test, and that they should keep trying to recall the items throughout the entire period. Also, they were told that the experimenter would announce each minute as it passed and, at this point, they should circle the number (i.e.,

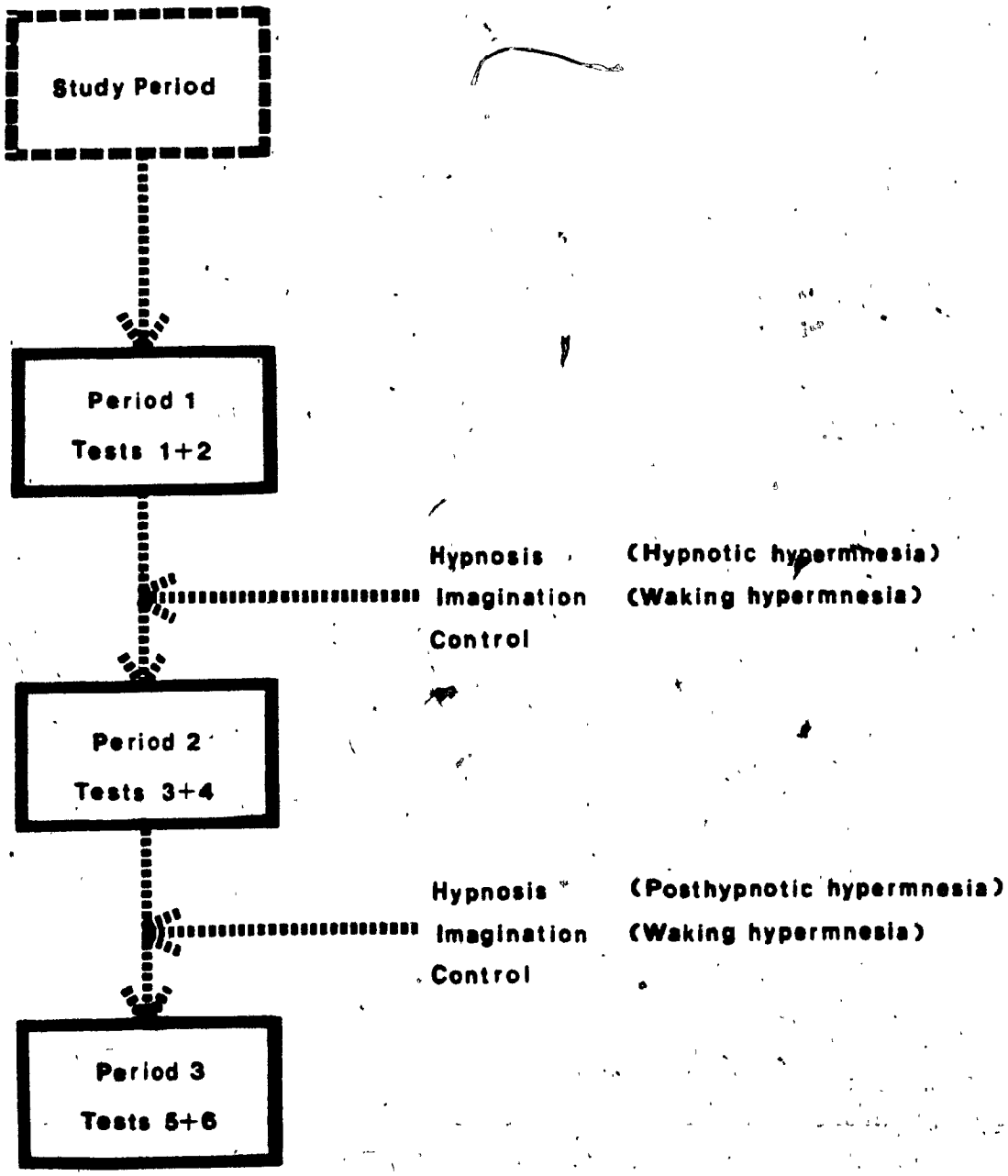

Figure 1. Schematic of the experimental procedure.

1-60) beside the item that they had just written down. It took 2 minutes to read these instructions, answer any questions, and provide subjects with the response sheet. This delay was also sufficient to reduce any recency effects from viewing the slides (Roediger & Payne, 1982.)

Test 1 began immediately following the instructions. After Test 1, there was another 2-minute period during which the response sheet was exchanged for a new one. Also, subjects were given a second set of instructions that paraphrased the initial instructions, and were urged to keep trying to recall throughout the test even if they thought that they had recalled as many items as they could. Further, it was emphasized to subjects that they should try to recall both previously remembered items as well as new items. Following this 2-minute period, a second 7-minute test (Test 2) was administered.

Period 2

During this period, subjects were treated according to their allocation to either the hypnosis, imagination, or control condition. Subjects in the <u>hypnosis condition</u> were informed that the experiment concerned the effects of hypnosis on memory, and were asked to make themselves comfortable in the chair and to close their eyes. Hypnotic subjects were then administered a 15-minute hypnotic induction procedure that consisted of a routine relaxation

induction procedure (adapted from Weitzenhoffer & Hilgard, 1962) and a deepening procedure based on the Chevreul pendulum effect (Chevreul, 1833; Easton & Shor, 1975, 1977). Following these procedures, subjects were given an explicit suggestion for hypnotic hypermnesia. Specifically, they were told that they would find it very easy to focus their attention and concentration on the pictures that they had seen, that these pictures would appear easily and effortlessly in their mind's eye, and that they would easily remember the pictures. Further, they were told that an interesting thing about hypnosis and memory was that the more items they recalled, the easier they would find it to recall even more.

Subjects in the imagination condition were informed that the experiment was concerned with the effects of imagination on memory. These subjects were then told that they would have 15 minutes to work on a task that was known to enhance imagination. They were told that the task was to solve a puzzle and that it was very important that they use imagery techniques in attempting to solve the puzzle, since this strategy would enhance the effects of imagination on their memory for the pictures. Next, subjects were given explicit instructions for hypermnesia. Specifically, they were told that because of enhanced imagination they would find it very easy to focus their attention and concentration on the pictures that they had seen, that these pictures would appear

easily and effortlessly in their mind's eye, and that they would easily remember the pictures. Further, they were told that an interesting thing about imagination and memory was that the more items they recalled, the easier they would find it to recall even more.

Subjects in the control condition were informed that they would have 15 minutes to work on a puzzle. These subjects were told that it was important that they try their best on the puzzle, but were given neither instructions as to why the puzzle was included nor any information about memory.

Following this 15-minute period, there was a 2-minute period during which response sheets were given out and a set of test instructions that paraphrased the earlier instructions was administered. Subjects were reminded that they should try to recall both previously remembered items as well as new ones. Test 3 was administered in the following 7-minute period. Following Test 3, there was another 2-minute period during which the recall sheets were exchanged for new ones. Also, hypnotic and imagination subjects were given instructions that paraphrased the hypermnesia suggestions or instructions, respectively, and all subjects were given paraphrased test instructions. Test 4 was administered in the following 7-minute period.

Period 3

During Period 3, subjects were again treated according to their allocation to either the hypnosis, imagination, or control condition. Subjects in the hypnosis condition were given an explicit suggestion for posthypnotic hypermnesia. Specifically, these subjects were told that, because of their experience of hypnosis, they would find that their memory for the pictures would continue to improve. Following these suggestions, they were dehypnotized. Subjects in the imagination condition were also given an explicit instruction for hypermnesia. Specifically, they were told that, because of their experience of imagination, they would find that their memory for the pictures would continue to improve. Subjects in the control condition were asked whether they had any new thoughts about the puzzle, but given no information about memory. All subjects were then given the test instructions that encouraged them to continue trying to recall as many items as they could. After this set of instructions, Test 5 was administered in the next 7-minute period. Following Test 5, subjects were given a new response sheet as well as paraphrased test instructions which included the information that the next test was to be the last one. This 2-minute period was followed by a 7-minute period in which Test 6 was administered.

Postexperimental Inquiry

The experimenter conducted a brief postexperimental inquiry at the end of Period 3 during which subjects were asked to comment in an open-ended fashion about their perceptions and experiences of the session. Also, subjects in the hypnosis, imagination, and control conditions were asked to rate on a 5-point scale (1 = not at all helpful, 5 = extremely helpful) how helpful they found the hypnosis, imagery task, or puzzle, respectively, to be for stimulating their memory for the pictures. Finally, the experimenter answered any questions, paid subjects for their participation, and terminated the session.

RESULTS

The present study yielded data relating to subjects' memory performance on the six recall tests as well as the confidence with which subjects reported their responses. Each measure was subjected to a 3 x 2 x 6 (Test Condition x Subject Grouping x Recall Test) mixed-model analysis of variance. Where significant effects were found, post hoc analyses using the Tukey "honestly significant difference" test (Hays, 1981) were performed to determine the source of the significance. The postexperimental inquiry also yielded relevant information concerning subjects' perceptions of the study. Appendix G and H contains a listing of the raw data and analysis of variance source tables, respectively.

Performance on Recall Tests

Since previous studies (e.g., Belmore, 1981; Roediger & Payne, 1982) analyzed hypermnesic effects separately in terms of total and cumulative items reported, the present study also used these measures to enable direct comparisons to be made across the various studies. Tables 1 and 2 present the mean number of total correct and incorrect items, respectively, reported by high and low hypnotizable subjects in the hypnosis, imagination, and control conditions for each of the recall tests. Total correct items are the total

number of accurate recalls on each recall test; similarly, total incorrect items are the total number of errors on each test.

For the correct items, there was a significant main effect for recall test, $F(5,210) = 82.03$, $p < .001$, indicating that recall increased across the six tests. Post hoc analysis indicated that the total number of correct items increased significantly across the first three tests ($p < .01$ in each case), but not across subsequent successive tests. There was no effect of either test condition or subject grouping on total correct recall, although a 3-way interaction effect approached significance, $F(10,210) = 1.80$, $.05 < p < .10$. This interaction reflected the observation that the hypermnesia effect was least for high hypnotizable subjects in the hypnosis condition than for subjects in any of the other cells.

For the incorrect items, there was a significant main effect only for recall test, $F(5,210) = 23.79$, $p < .001$, indicating that the number of errors increased across the six recall tests. Post hoc analysis indicated that the total number of incorrect items did not increase significantly between any successive tests except between Tests 2 and 3 ($p < .05$), where the 15-minute interval occurred.

Table 1

Mean Number of Total Correct Items

Test Condition and Subject Grouping	Recall 1	Recall 2	Recall 3	Test 4	Test 5	Test 6
Hypnosis						
High	30.12 (6.06)	32.38 (8.57)	32.88 (7.62)	33.88 (8.10)	34.62 (8.88)	35.12 (7.92)
Low	29.88 (8.13)	33.00 (9.68)	36.25 (10.91)	37.62 (10.28)	38.88 (11.02)	38.38 (11.31)
Group mean	30.00 [7.10]	32.69 [9.12]	34.56 [9.20]	35.75 [9.23]	36.75 [9.70]	36.75 [9.62]
Imagination						
High	30.50 (7.31)	33.25 (7.02)	35.50 (7.23)	36.25 (7.46)	37.00 (8.35)	38.38 (7.15)
Low	33.25 (5.28)	34.63 (3.92)	36.38 (5.40)	38.25 (4.43)	38.62 (5.07)	39.00 (4.87)
Group mean	31.88 [6.30]	33.94 [5.47]	35.94 [6.32]	37.25 [5.94]	37.81 [6.71]	38.69 [6.01]
Control						
High	31.50 (4.90)	33.38 (3.62)	36.38 (5.37)	37.62 (3.96)	38.12 (6.01)	38.88 (5.11)
Low	32.38 (4.57)	34.38 (3.70)	36.75 (2.82)	37.38 (3.42)	38.38 (3.46)	39.50 (3.82)
Group mean	31.94 [4.14]	33.88 [3.66]	36.56 [4.10]	37.50 [3.69]	38.25 [4.74]	39.19 [4.46]
Grand mean	31.27 [5.84]	33.50 [6.08]	35.69 [6.54]	36.63 [6.29]	37.60 [7.05]	38.21 [5.98]

Note. Standard deviations appear in parentheses.

Table 2

Mean Number of Total Incorrect Items

Test Condition and Subject Grouping	Recall Test 1	2	3	4	5	6
Hypnosis						
High	2.50 (2.39)	4.12 (3.68)	4.75 (5.01)	6.00 (6.12)	7.12 (6.60)	7.62 (5.95)
Low	1.25 (1.16)	1.00 (1.31)	2.75 (2.82)	2.38 (2.33)	3.50 (3.66)	4.62 (5.10)
Group mean	1.88 [1.78]	2.56 [2.50]	3.75 [3.92]	4.19 [4.22]	5.31 [5.13]	6.12 [5.52]
Imagination						
High	1.50 (1.69)	2.12 (2.90)	3.75 (4.77)	4.25 (4.23)	5.00 (4.44)	6.25 (5.23)
Low	.38 (.52)	.88 (1.73)	1.00 (1.07)	1.00 (1.07)	2.00 (1.69)	2.38 (1.41)
Group mean	.94 [1.10]	1.50 [2.31]	2.38 [2.92]	2.62 [2.65]	3.50 [3.86]	4.32 [3.32]
Control						
High	1.12 (1.64)	.88 (1.25)	2.25 (1.83)	2.38 (2.00)	2.25 (2.25)	2.50 (2.56)
Low	1.38 (2.33)	1.62 (3.02)	2.88 (3.00)	2.88 (3.76)	4.25 (6.02)	4.00 (6.09)
Group mean	1.25 [1.98]	1.25 [2.14]	2.56 [2.81]	2.63 [2.88]	3.25 [4.14]	3.25 [4.32]
Grand mean	1.36 [1.62]	1.77 [1.75]	2.90 [3.22]	3.15 [3.25]	4.02 [4.11]	4.56 [4.39]

Note. Standard deviations appear in parentheses.

Cumulative scores were computed for correct and incorrect items in order to examine the cumulative hypermnesic effect across all cells. Cumulative correct and incorrect items were calculated by summing the total number of unique correct or incorrect responses produced over successive recall trials. As Tables 3 and 4 indicate, all 6 groups showed increases for both correct recalls and errors across the 6 recall tests. For both correct and incorrect responses, there was a significant main effect only for recall test $F(5,210) = 292.53$, $p < .001$, and $F(5,210) = 32.96$, $p < .001$, respectively, which paralled the previous analyses. Post hoc tests showed that the number of cumulative correct items increased significantly across the first four tests only ($p < .01$ in each case), while the number of cumulative incorrect items increased significantly across nonsuccessive tests only ($p < .01$ in each case). In addition, there was a significant interaction between subject grouping and recall test for incorrect items, $F(5,210) = 2.60$, $p < .05$. This interaction reflected the fact that the increase in cumulative errors across the six tests was significantly greater for high hypnotizable subjects than for low hypnotizable individuals across the last three tests ($p < .05$).

Table 3

Mean Number of Cumulative Correct Items

Test Condition and Subject Grouping	1	2	Recall 3	Test 4	5	6
Hypnosis						
High	30.12 (6.06)	34.62 (7.13)	37.38 (6.78)	38.75 (6.84)	39.75 (7.38)	40.50 (6.61)
Low	29.88 (8.13)	34.75 (9.56)	38.00 (10.53)	39.25 (10.11)	40.75 (11.09)	41.12 (11.13)
Group mean	29.50 [7.10]	34.68 [8.34]	37.69 [8.66]	39.00 [8.48]	40.25 [9.24]	40.81 [8.87]
Imagination						
High	30.50 (7.31)	35.12 (7.00)	37.88 (6.33)	39.25 (7.04)	40.75 (6.50)	41.75 (6.30)
Low	33.25 (5.28)	36.88 (4.39)	39.75 (4.65)	41.62 (4.24)	43.00 (3.85)	43.62 (4.13)
Group mean	31.88 [6.30]	36.00 [5.74]	38.82 [5.49]	40.43 [5.64]	41.88 [5.18]	42.68 [5.22]
Control						
High	31.50 (4.90)	36.00 (3.21)	39.00 (3.70)	41.12 (3.56)	42.62 (4.93)	43.12 (5.19)
Low	32.38 (4.56)	36.75 (3.45)	39.50 (2.88)	40.25 (3.33)	41.38 (3.34)	42.12 (3.52)
Group mean	31.94 [4.73]	36.38 [3.33]	39.25 [3.29]	40.68 [3.44]	42.00 [4.14]	42.62 [4.36]
Grand mean	31.11 [6.04]	35.69 [5.00]	39.59 [5.01]	40.04 [5.05]	41.38 [6.19]	42.04 [6.15]

Note. Standard deviations appear in parentheses.

Table 4

Mean Number of Cumulative Incorrect Items

Test Condition and Subject Grouping	Recall 1	2	3	Test 4	5	6
Hypnosis						
High	2.50 (2.39)	5.25 (5.34)	7.62 (7.98)	9.38 (10.17)	11.62 (11.16)	13.50 (12.54)
Low	1.25 (1.16)	1.75 (1.67)	3.62 (3.74)	4.38 (4.50)	5.25 (5.26)	6.12 (6.53)
Group mean	1.88 [1.78]	3.50 [3.50]	5.62 [5.86]	6.88 [7.34]	8.44 [8.21]	9.81 [9.54]
Imagination						
High	1.50 (1.69)	2.50 (3.07)	4.88 (5.59)	6.00 (6.68)	7.75 (7.89)	9.50 (8.99)
Low	.38 (.52)	1.00 (1.69)	1.25 (1.67)	1.88 (1.88)	2.62 (2.06)	3.38 (2.56)
Group mean	.94 [1.10]	1.75 [2.38]	3.06 [3.63]	3.94 [4.28]	5.18 [4.98]	6.64 [5.78]
Control						
High	1.12 (1.64)	1.50 (1.77)	2.75 (1.98)	3.50 (2.78)	3.75 (2.92)	4.38 (3.62)
Low	1.38 (2.33)	1.75 (3.01)	3.25 (4.50)	3.88 (5.00)	5.12 (7.00)	5.62 (8.05)
Group mean	1.25 [1.98]	1.63 [2.39]	3.00 [3.24]	3.69 [3.93]	4.44 [4.82]	5.00 [5.84]
Grand mean	1.36 [1.62]	2.29 [2.75]	3.89 [4.16]	4.83 [5.18]	6.02 [5.74]	7.15 [7.05]

Note. Standard deviations appear in parentheses.

The proportion of cumulative correct and incorrect items relative to total output was also computed and analyzed in order to obtain a better understanding of how each type of response reciprocally contributed to the overall pattern of responses. Tables 5 and 6 present these data. As in all previous analyses, there was a significant main effect of recall test, $F(5,210) = 44.21$, $p < .001$. Post hoc tests revealed that the proportion of cumulative correct items decreased, whereas the proportion of cumulative errors increased, across all nonsuccessive tests ($p < .01$ in each case), but not between any successive tests except the second and third tests ($p < .01$). A main effect of subject grouping approached significance, $F(1,42) = 3.64$, $.05 < p < .10$, which suggests a tendency for high hypnotizable subjects to produce more errors and fewer correct responses relative to total recall than low hypnotizable subjects.

The main finding of interest was a significant interaction effect between subject grouping and recall test, $F(5,210) = 2.35$, $p < .05$. This interaction reflected the fact that across the last 5 recall tests, the proportion of errors increased for high hypnotizable subjects compared to low hypnotizable subjects, whereas the proportion of correct items decreased in a reciprocal fashion ($p < .05$ in each case).

Table 5

Mean Proportion of Cumulative Correct Items

Test Condition and Subject Grouping	Recall 1	2	3	Test 4	5	6
Hypnosis						
High	.92 (.06)	.87 (.10)	.84 (.12)	.82 (.14)	.79 (.14)	.77 (.15)
Low	.96 (.04)	.95 (.06)	.91 (.09)	.90 (.10)	.89 (.11)	.88 (.13)
Group mean	.94 [.05]	.91 [.08]	.88 [.10]	.86 [.12]	.84 [.12]	.82 [.14]
Imagination						
High	.95 (.06)	.93 (.07)	.89 (.10)	.87 (.11)	.85 (.13)	.83 (.15)
Low	.99 (.02)	.97 (.05)	.97 (.04)	.96 (.04)	.94 (.04)	.93 (.05)
Group mean	.97 [.04]	.95 [.06]	.93 [.07]	.92 [.08]	.90 [.08]	.88 [.10]
Control						
High	.97 (.04)	.96 (.04)	.93 (.04)	.92 (.06)	.92 (.05)	.91 (.07)
Low	.96 (.06)	.95 (.07)	.93 (.09)	.92 (.09)	.90 (.11)	.90 (.12)
Group mean	.96 [.05]	.96 [.06]	.93 [.05]	.92 [.08]	.91 [.08]	.90 [.10]
Grand mean	.96 [.05]	.94 [.07]	.91 [.08]	.90 [.09]	.88 [.09]	.87 [.11]

Note. Standard deviations appear in parentheses.

Table 6

Mean Proportion of Cumulative Incorrect Items

Test Condition and Subject Grouping	Recall 1	2	3	Test 4	5	6
Hypnosis						
High	.08 (.06)	.13 (.10)	.16 (.12)	.18 (.14)	.21 (.14)	.23 (.15)
Low	.04 (.04)	.05 (.06)	.09 (.09)	.10 (.10)	.11 (.11)	.12 (.13)
Group mean	.06 [.05]	.09 [.08]	.12 [.10]	.14 [.12]	.16 [.12]	.18 [.14]
Imagination						
High	.05 (.06)	.07 (.07)	.11 (.10)	.12 (.11)	.15 (.13)	.17 (.15)
Low	.01 (.02)	.03 (.05)	.03 (.04)	.04 (.04)	.06 (.04)	.07 (.05)
Group mean	.03 [.04]	.05 [.06]	.07 [.07]	.08 [.08]	.10 [.08]	.12 [.10]
Control						
High	.03 (.04)	.04 (.04)	.06 (.04)	.08 (.06)	.08 (.06)	.09 (.07)
Low	.04 (.06)	.04 (.07)	.07 (.07)	.08 (.09)	.10 (.11)	.10 (.12)
Group mean	.04 [.05]	.04 [.06]	.07 [.06]	.08 [.08]	.09 [.08]	.10 [.10]
Grand mean	.04 [.05]	.06 [.07]	.09 [.08]	.10 [.09]	.12 [.09]	.13 [.11]

Note. Standard deviations appear in parentheses.

Confidence Ratings of Total Correct and Incorrect Items

The mean confidence rating (scale = 1-3) for both total correct and incorrect items was computed according to subject grouping and test condition for each recall test. These data are presented in Tables 7 and 8. For the confidence rating associated with the correct items, there was a significant interaction effect between subject grouping and recall test, $F(5,210) = 3.73$, $p < .01$, but no other significant main or interaction effects. Post hoc analysis indicated that the confidence ratings that high hypnotizable subjects associated with their correct recalls increased from first to last test, whereas the confidence ratings that low hypnotizable subjects associated with their correct recalls decreased from first to last test ($p < .05$). For the confidence ratings associated with incorrect items, there were no significant main or interaction effects.

An additional analysis was performed on only those incorrect items that subjects had reported with a confidence rating of 3. That is, these items were errors, but subjects had confidently judged them as having been among the slides they had seen earlier. The mean number of "confident errors" reported by subjects in their respective cells across the 6 recall tests is presented in Table 9. This analysis was considered to be highly relevant since other studies (e.g., Dywan & Bowers, 1983; Sheehan & Tilden, 1983) have reported that compared to waking performance, hypnosis leads to the

Table 7

Mean Confidence Ratings of Total Correct Items

Test Condition and Subject Grouping	Recall 1	2	3	Test 4	5	6
Hypnosis						
High	2.97 (.06)	2.94 (.10)	2.97 (.09)	2.97 (.05)	2.98 (.05)	2.99 (.02)
Low	2.92 (.10)	2.92 (.07)	2.95 (.08)	2.94 (.12)	2.91 (.14)	2.92 (.10)
Group mean	2.94 [.08]	2.93 [.08]	2.96 [.08]	2.96 [.08]	2.94 [.10]	2.96 [.06]
Imagination						
High	2.90 (.09)	2.88 (.09)	2.93 (.04)	2.93 (.03)	2.90 (.05)	2.90 (.05)
Low	2.95 (.08)	2.94 (.07)	2.94 (.04)	2.91 (.06)	2.91 (.05)	2.92 (.04)
Group mean	2.92 [.08]	2.91 [.08]	2.93 [.04]	2.92 [.04]	2.90 [.05]	2.91 [.04]
Control						
High	2.94 (.04)	2.93 (.05)	2.94 (.05)	2.94 (.04)	2.96 (.03)	2.96 (.03)
Low	2.93 (.08)	2.96 (.05)	2.94 (.06)	2.94 (.06)	2.90 (.09)	2.90 (.09)
Group mean	2.94 [.06]	2.94 [.05]	2.94 [.06]	2.94 [.05]	2.93 [.06]	2.93 [.06]
Grand mean	2.93 [.08]	2.93 [.07]	2.94 [.06]	2.94 [.06]	2.92 [.07]	2.93 [.05]

Note. Standard deviations appear in parentheses.

Table 8

Mean Confidence Ratings of Total Incorrect Items

Test Condition and Subject Grouping	Recall Test 1	2	3	4	5	6
Hypnosis						
High	1.61 (6) (.84)	1.61 (7) (.75)	1.89 (7) (.85)	1.99 (7) (.72)	1.83 (8) (.75)	2.00 (8) (.70)
Low	1.70 (5) (.84)	1.60 (5) (.89)	1.71 (6) (.78)	1.72 (6) (.77)	1.65 (6) (.77)	1.81 (7) (.88)
Group mean	1.66 (11) [.84]	1.60 (12) [.82]	1.80 (13) [.82]	1.85 (13) [.74]	1.74 (14) [.76]	1.90 (15) [.83]
Imagination						
High	2.10 (5) (.74)	1.77 (5) (.83)	1.77 (7) (.87)	1.68 (7) (.71)	1.51 (7) (.69)	1.39 (7) (.38)
Low	2.67 (3) (.58)	2.27 (3) (.64)	2.40 (5) (.55)	1.87 (5) (1.04)	1.73 (8) (.85)	1.79 (8) (.78)
Group mean	2.38 (8) [.66]	2.02 (8) [.74]	2.00 (12) [.71]	1.78 (12) [.87]	1.62 (15) [.77]	1.59 (15) [.58]
Control						
High	1.76 (5) (.83)	1.67 (3) (.76)	1.67 (7) (.45)	1.80 (7) (.75)	1.94 (6) (.71)	1.86 (7) (.86)
Low	1.51 (5) (.87)	1.47 (5) (.87)	1.79 (8) (.87)	1.33 (8) (.71)	1.35 (8) (.70)	1.36 (8) (.70)
Group mean	1.64 (10) [.85]	1.57 (8) [.82]	1.73 (15) [.66]	1.56 (15) [.73]	1.64 (14) [.70]	1.61 (15) [.88]
Grand mean	1.89 (29) [.78]	1.73 (28) [.79]	1.28 (40) [.73]	1.73 (40) [.78]	1.67 (43) [.74]	1.70 (45) [.76]

Note. Standard deviations appear in parentheses.
Group sizes vary according to the number of subjects who reported incorrect items. Group sizes are reported in parentheses beside the ratings.

generation of a greater number of recall errors that subjects rate as true memories, especially high hypnotizable subjects.

Significant main effects of recall test, $F(5,210) = 17.05$, $p < .001$, and subject grouping, $F(1,42) = 3.99$, $p = .05$, were found. There were also significant interaction effects of subject grouping x test condition, $F(2,42) = 3.42$, $p < .05$, subject grouping x recall test, $F(5,210) = 4.69$, $p < .001$, test condition x recall test, $F(10,210) = 3.73$, $p < .001$, and subject grouping x test condition x recall test, $F(10,210) = 4.83$, $p < .001$.

Post hoc analyses of the reliable main effects indicated that the cumulative confident errors increased significantly across all nonsuccessive tests ($p < .05$ in each case). Further, high hypnotizable subjects produced significantly more confident errors than low hypnotizable subjects.

Post hoc analyses were also performed on the significant interaction effects. For the subject grouping x test condition interaction, the high hypnotizable subjects in the hypnosis condition produced more confident errors than subjects in any other cell ($p < .05$). This finding concurs with the reports of both Dywan & Bowers (1983) and Sheehan & Tilden (1983).

In terms of the interaction between subject grouping and recall test, the increase in confident errors was

Table 9

Mean Number of Cumulative "Confident Errors"

Test Condition and Subject Grouping	Recall 1	2	3	Test 4	5	6
Hypnosis						
High	.62 (.92)	1.12 (1.64)	2.50 (3.62)	3.37 (3.85)	4.62 (5.04)	5.62 (5.15)
Low	.25 (.46)	.25 (.46)	.50 (.76)	.50 (.76)	.62 (.74)	.75 (.88)
Group mean	.44 [.69]	.68 [1.05]	1.50 [2.19]	1.29 [2.30]	2.62 [2.89]	3.18 [3.82]
Imagination						
High	.62 (1.19)	.75 (1.49)	1.00 (1.41)	1.12 (1.46)	1.12 (1.46)	1.38 (1.77)
Low	.25 (.46)	.38 (.74)	.62 (1.06)	.62 (1.06)	.88 (1.12)	1.00 (1.20)
Group mean	.44 [.82]	.56 [1.12]	.81 [1.24]	.87 [1.26]	1.00 [1.28]	1.19 [1.48]
Control						
High	.12 (.35)	.25 (.46)	.25 (.46)	.62 (.74)	.88 (.83)	.88 (.83)
Low	.25 (.46)	.25 (.46)	.88 (.83)	.88 (.83)	1.00 (1.07)	1.00 (1.07)
Group mean	.18 [.40]	.25 [.46]	.56 [.64]	.75 [.78]	.94 [.95]	.94 [.95]
Grand mean	.35 [.64]	.50 [.88]	.96 [1.36]	.97 [1.45]	1.50 [1.71]	1.77 [1.82]

Note. Standard deviations appear in parentheses.

significantly greater for high hypnotizable subjects across the last three recall tests than for low hypnotizable subjects ($p < .01$ in each case). For the test condition x recall test interaction, subjects in the hypnosis condition made more confident errors across the last three recall tests than subjects in either the imagination or control conditions ($p < .05$ in each case). Finally, for the 3-way interaction of subject grouping x test condition x recall test, the increase in confident errors was significantly greater for high hypnotizable subjects in the hypnosis condition across the last three recall tests than for subjects in any other group ($p < .01$ in each case).

Postexperimental Inquiry Information

For the postexperimental inquiry, data concerning subjects' perceptions of how helpful they found the hypnosis, imagination task, or puzzle to be for stimulating their memory for the pictures were obtained. Table 10 presents the mean ratings of helpfulness given by high and low hypnotizable subjects tested in the hypnosis, imagination, and control conditions. A 3 x 2 (Test Condition x Subject Grouping) analysis of variance yielded a significant main effect for test condition, $F(2,42) = 14.18$, $p < .001$, but no other significant main or interaction effects. Post hoc analysis indicated that ratings in both the hypnosis and

imagination conditions were significantly greater than those in the control condition ($p < .05$ in each case). That is, subjects tested in the hypnosis and imagination conditions attributed changes in their memory performance to the impact of the experimental manipulations employed.

Table 18

Mean Ratings of Helpfulness of Experimental Manipulation

Test Condition	Subject Grouping	
	High Hypnotizable	Low Hypnotizable
Hypnosis	2.62 (.92)	3.37 (1.19)
Imagination	2.62 (.92)	2.25 (1.04)
Control	1.62 (.92)	1.00 (.00)

Note. Standard deviations appear in parentheses.
1 = not at all helpful, 5 = extremely helpful.

DISCUSSION

Results of the present study clearly confirmed the previously reported hypermnesic effects of repeated testing (e.g., Belmore, 1981; Erdelyi & Kleinbard, 1978; Roediger & Payne, 1982). Specifically, the study indicated that the amount of both correct and incorrect material reported increased over repeated testing for subjects in hypnosis, imagination, and control conditions; however, the increase in correct material was least for high hypnotizable individuals. Further, the proportion of correct items relative to total items was lower for high hypnotizable subjects than it was for low hypnotizable subjects. Correspondingly, the proportion of incorrect items was greater for high hypnotizable individuals. In addition, the confidence that subjects associated with their correct memories increased for high hypnotizable subjects after repeated testing and decreased for low hypnotizable subjects, although the confidence that subjects associated with their incorrect memories was essentially equivalent for all groups. Importantly, high hypnotizable subjects in the hypnosis condition indicated that they were confident of the accuracy of appreciably more incorrect items than any other group.

The findings of the present study suggest a number of inferences that can be drawn regarding the impact of hypnosis

on visual memory as well as the relevance of hypnotizability. In addition, the present findings carry implications for the applied use of hypnosis.

Impact of Hypnosis

The present study indicated that neither hypnosis nor imagination enhances an individual's waking memory beyond normal waking performance; that is, hypnotic and waking hypermnesia were equivalent. On the one hand, this finding is consistent with a range of studies (e.g., McConkey & Nogrady, 1983; Putnam, 1979; Sheehan & Tilden, 1983; Wagstaff, 1982, 1983; Zelig & Beidleman, 1981) that have similarly reported no appreciable differences between hypnotic and nonhypnotic procedures in terms of their impact on accurate visual memory. On the other hand, the finding of no impact of hypnosis is inconsistent with the report of Dywan and Bowers (1983) who found that hypnosis led to memory enhancement in subjects exposed to repeated testing.

The procedural differences between the two studies, however, may partially or wholly account for this apparent contradiction. For instance, Dywan and Bowers (1983) tested subjects after they had made nine recall attempts over a period of a week; by contrast, subjects in the present study had made only two recall attempts in the same session before the hypnotic induction was administered. Thus, this differential feature could be interpreted to mean that

hypnosis has a greater impact after either a longer period of time or a greater number of recall attempts. Further, whereas Dywan and Bowers (1983) defined high hypnotizable subjects as those who scored 7 and above on a 12-point scale, the present study used more stringent selection procedures in order to isolate very high and very low hypnotizable individuals. It could be argued, therefore, that the use of very high hypnotizable subjects in the present study may not have allowed any potential benefits of hypnosis to become apparent. For example, when deeply hypnotized, it is conceivable that these subjects may have found it difficult to provide written responses on the recall tests.

Hypnosis versus Hypnotic Context

One implication of the present data is that increases in memory that have been observed in case studies (e.g., Kroger & Douce, 1979) may have been due to repeated recall attempts or the hypnotic context rather than to any specific impact of hypnosis. For instance, when a motivated subject agrees to participate in a hypnotic investigation and expects changes in memory to occur, it is not surprising that some additional memory can almost always be obtained. Such changes, however, may not be due to the experience of hypnosis, but instead may be products of the hypnotic context. Hence, even essentially unhypnotizable individuals may recall more information in the context of a hypnotic induction procedure. Thus, in many clinical and forensic situations, hypnotic procedures may

simply provide an external event to which individuals can attribute any memory changes that do occur. This explanation is entirely reasonable considering that most individuals have strong preconceptions that hypnosis not only improves memory, but also leads to the reporting of accurate information (Loftus & Loftus, 1980; Orne et al., in press).

This reasoning is also supported by data obtained during the postexperimental inquiry of the present study. Specifically, individuals tested in the hypnosis and imagination conditions attributed their increased recall to either the hypnosis or imagination instructions to which they had been exposed. These beliefs are clear misattributions, however, since the performance of these subjects was similar to that of subjects tested in the control condition. It should also be noted that such misattributions represent part of the more global problem of using verbal reports in the field of hypnosis. Specifically, it has been demonstrated that individuals who have been exposed to hypnotic procedures often report that all of their behavior is the result of hypnosis even when such is not the case (Sheehan & McConkey, 1982). Thus, when hypnosis is used to enhance the memory of individuals in the forensic setting, the expectancy of change, combined with the compelling nature of some of the information retrieved, understandably fosters the notion that hypnosis must be responsible for these effects. Further, as Timm (1983) has noted, the ratings of the positive impact of

hypnosis given by those who use it or are exposed to it in the forensic context may be more an index of perceived rather than actual benefit.

Given that the current approach of "investigative hypnotists" is to inform victims and witnesses that memory is like a videotape recorder in the mind (Reiser, 1980), this method is potentially very dangerous in forensic situations since the hypnotized individual may become unshakably convinced of remembered material, irrespective of its accuracy. Future research, therefore, could profitably investigate the reasons underlying people's misattributions in order to determine the most appropriate way to present information about hypnosis and memory to an individual before he or she is hypnotized for the purposes of memory enhancement.

The present study did not support the findings of Dywan and Bowers (1983) that hypnosis leads to greater generation of incorrect material compared to waking procedures. Instead, the present data strongly indicated that it is the effect of repeated testing, whether or not hypnosis was involved, that primarily underlies the increase in the amount of incorrect information reported. A comparison of the present study with that of Dywan and Bowers (1983), however, suggests that this discrepancy may reflect the differential impact of the contextual demands in the two studies. Specifically, Dywan and Bowers (1983) employed a forced

recall procedure in which subjects were required to generate responses that they knew were incorrect. Subsequently, these subjects may have incorporated much of this incorrect material into memory and retrieved it as correct information. By contrast, subjects in the present study were not forced to generate a fixed number of responses, and thus, were not compelled to report incorrect material.

This procedural difference suggests that hypnosis may lead subjects to incorporate into their memory either material that they have been forced to generate themselves (e.g., Dywan & Bowers, 1983), or material that is provided for them, as in the case of leading questions (e.g., Putnam, 1979; Zelig & Beidleman, 1981), but that hypnosis in and of itself does not necessarily lead subjects to generate incorrect material. In other words, it appears to be the contextual demands of the hypnotic situation, and not the experience of hypnosis, that leads subjects to generate incorrect information; however, it may also be that the experience of hypnosis allows subjects to incorporate this incorrect material into their memories once it is available. Thus, future research could usefully determine whether the hypnotic experience or the hypnotic context leads subjects to either generate incorrect material themselves or to incorporate into memory incorrect material that is provided by the hypnotist.

It should also be noted that the distinction between

hypnotic experience and hypnotic context is a critical one in the clinical application of hypnosis (e.g., Perry, Gelfand, & Marcovitch, 1979; Wadden & Anderton, 1982), but is not one that has been fully appreciated nor investigated in the forensic context. Hence, future research could also attempt to isolate the specific effects of hypnosis from the nonspecific effects (e.g., motivation of subjects, information given about hypnosis and memory, expectations of improvement by subjects) of the hypnotic context.

Relevance of Hypnotizability

Consistent with previous research (e.g., Dywan & Bowers, 1983; Sheehan & Tilden, 1983), the present study also suggests the relevance of hypnotizability to subjects' memory performance. For instance, results showed that high hypnotizable subjects reported a lower proportion of correct and a higher proportion of incorrect items, relative to total output, than low hypnotizable subjects. Similarly, Sheehan and Tilden (1983) reported that high, rather than low, hypnotizable subjects were more likely to generate incorrect material in both hypnosis and waking conditions in their memory reports of a purse-snatching incident. On the basis of these collective data, it could be argued that high hypnotizable subjects are more responsive than low hypnotizable individuals to the contextual demands of hypnosis and tend to meet those demands by providing a greater amount of incorrect material. Moreover, because

hypnosis tends to lower critical judgment (Orne & Hammer, 1974), it may make this process even easier. Overall then, these findings strongly suggest that hypnotizability is an important factor influencing subjects' memory performance.

Although relatively little research has examined the relationship between hypnotic ability and memory performance, the present study suggests that high and low hypnotizable subjects may differ in their styles of processing information even when hypnosis is not involved. Similarly, other data (e.g., Crawford & Allen, 1983; Nogrady et al., 1983) also support the argument of Sheehan and McConkey (1982) that the performance of high hypnotizable subjects on various tasks may be meaningfully associated with differences that can be observed in the styles or modes of cognition (see Sheehan & McConkey, 1982, for a detailed discussion and relevance of styles of processing to hypnosis and hypnotizability).

One recent study (Laurence, Nadon, Nogrady, & Perry, 1983), for example, focused on the degree to which high hypnotizable individuals incorporated a suggested event into memory and also highlighted the differences within this group in terms of their responses to the suggested memory distortion. Specifically, subjects who reported multiple levels of awareness during hypnosis were more likely to incorporate the suggested information into memory than those who did not. Their findings also paralleled the observations of Bernheim (1888) and Orne (1979) that high hypnotizable

individuals are particularly prone to becoming involved in believed-in imaginings (Sarbin & Coe, 1972). An important implication of these findings is that researchers should focus as much on the relevance of hypnotizability as they do on the relevance of hypnotic procedures in attempting to determine the factors influencing memory performance. Thus, future research should attempt to determine the extent to which hypnotizability is associated with differences in correct and incorrect memory performance.

Confidence in Memory

With repeated testing, high and low hypnotizable subjects differed in terms of the changes associated with the certainty of their responses. That is, while initially there were no differences in the confidence ratings of accurate material, after several recall tests, the confidence that high hypnotizable subjects associated with the correct material increased, whereas the confidence ratings that low hypnotizable individuals associated with the correct material decreased. Notably, however, no changes were observed as a function of hypnosis, although other data (e.g., Sheehan & Tilden, 1983;) suggest that hypnosis leads to increased confidence in recalled material.

Importantly, the degree of confidence that all subjects attached to their recall was much higher than that attached to the incorrect material that they reported. This

observation suggests that subjects in this study had a high degree of knowledge about the extent to which the memories that they reported were correct or incorrect despite the fact that research has indicated that memories for imagined and perceived events can be confused (e.g., Johnson, Raye, Wang, & Taylor, 1979). Analysis of only those incorrect items that subjects had confidently rated as correct indicated that high hypnotizable subjects in the hypnosis condition produced significantly more of these "confident errors" than any other group. This finding indicates that these individuals are more prone to confuse real and imagined memories than less hypnotizable individuals, especially within the hypnotic context.

Thus the use of confidence ratings would appear to be a potentially useful way to discriminate between veridical and nonveridical memory reports, particularly when hypnosis is involved. It is notable in this respect that most forensic applications of hypnosis to enhance memory do not request subjects to make confidence ratings; instead, investigators inform subjects at the outset that all of what they recall will be veridical (Reiser, 1980).

Implications for Applied Hypnosis

The present study followed procedures associated with experimental analyses of waking hypermnesia (e.g., Erdelyi & Becker, 1974; Roediger & Payne, 1982) and did not follow

procedures associated with the applied use of hypnosis to enhance memory (e.g., Kroger & Douce, 1979). For example, the type of stimulus material, the level of emotional arousal, the type of learning, and the consequences of recall in the present study were all different from what would occur in a naturalistic setting; see Smith (1983) for a discussion of these issues in evaluating the discrepancies commonly observed between laboratory-based and case study investigations of hypnotic memory enhancement. Accordingly, the limitations and generality of the present research require comment.

One possible limitation concerns the nature of the hypnotic hypermnesia effect possible with the type of stimuli employed. Substantial research (e.g., Erdelyi & Becker, 1974; Roediger & Payne, 1982) has indicated the effects of waking hypermnesia for the type of visual stimuli employed in the present study. Although the present study confirmed waking hypermnesia with such stimuli, findings indicated no additional impact of hypnosis. In this respect, it may be that waking hypermnesia occurs to such a degree with these particular stimuli that hypnosis could not add anything more; that is, a type of ceiling effect may have been operating. It is important to note, however, that even on the last recall test subjects did not recall all of the items; that is, many items were still available for retrieval. Nevertheless, future research could usefully employ stimulus

materials that do not show as strong a waking hypermnesia effect as those used in the present study; see Erdelyi (1982) and Roediger et al. (1982) for a discussion of the degree to which various stimuli show hypermnesic effects.

Another possible limitation that is relevant to the generality of the findings is that the stimuli used in the present study carried no affective meaning for subjects. In the applied situation, the information to be remembered is often emotionally charged and personally meaningful for the individual concerned. In fact, some case study reports (e.g., Dorcus, 1960) have indicated that hypnosis may have a greater impact with material that is affect-laden, although research has failed to confirm this hypothesis in an unequivocal manner (e.g., DePiano & Salzberg, 1981). The present study, however, made no attempt to give affect meaning to stimulus materials. In this respect, argument can be made that whereas there is no difference between waking and hypnotic hypermnesia for nonaffective stimuli, there may be a difference for affective materials. Further, the introduction of hypnosis for the purposes of recovering traumatic information may lead subjects to report more inaccurate material or to have greater confidence in the accuracy of any memories they do recover. For instance, in the present study, subjects exposed to hypnosis were very confident of the accuracy of the incorrect material that they reported. Furthermore, it is conceivable that such effects

would be magnified within the emotionally charged context of a forensic investigation.

If, indeed, hypnosis does have a differential impact on the recovery of affective and nonaffective information, it is relevant to note that the forensic applications of hypnosis to enhance memory typically attempt to minimize any affect associated with the memories under investigation (Reiser, 1980). However, since the affective nature of materials is a highly relevant retrieval cue (Bower, 1980), this practice in forensic settings would appear to limit, rather than maximize, the potential retrieval benefits of hypnosis. A clear distinction must also be made here between the use of hypnosis as a technique to facilitate the lifting of repression of a traumatic memory and the use of hypnosis as an aid to enhance the memory of a neutral event (see Erdelyi & Goldberg, 1979, for a discussion of the similarities and differences between the lifting of repression and hypermnesic effects).

Another feature of the present investigation that may limit the generality of the findings is the type of hypnotic induction and hypermnesic suggestions employed. That is, whereas a standardized induction procedure was used in the present study, it may be that a more individualized approach that focuses on having subjects experience hypnosis as deeply as possible would have led to enhancement effects of hypnosis. Further, the present study used a direct

suggestion for hypermnesia; that is, subjects were given the suggestion that their memory would improve. An alternative approach would have been to use a regression suggestion and have subjects relive the viewing of the slides and to report stimuli as they again saw them in their mind's eye, rather than simply trying to remember them. Such a regression approach can be very useful in the clinical context, although research that has used regression suggestions (e.g., Sheehan & Tilden, 1983) has not yielded any enhancement effect of hypnosis. Thus, generalization of findings from the present study may be limited to situations in which direct suggestions are employed.

These issues suggest a number of questions that require investigation in future research. For instance, similar procedures to those employed in forensic studies could be used. Thus, instructions to subjects in a hypnosis condition could include the videotape model of memory that some forensic investigators (e.g., Reiser, 1980) employ routinely. Further, stimulus materials that do not show as strong a waking hypermnesia effect or stimulus materials that have meaningful affect associated with them could be tested. The use of more individualized hypnotic induction procedures, as well as regression rather than direct suggestion techniques, could also be examined.

Conclusions

In summary, the present study employed rigorous procedures derived from the field of cognitive psychology as one way of investigating the potential impact of hypnosis on the recall of visual material. Findings indicated that hypnosis neither helped nor hindered recall performance, but did lead to high confidence in high hypnotizable subjects regarding the accuracy of the inaccurate material they reported. Although future research needs to establish the generality of the present findings, and although the present study was not designed to closely parallel the investigative use of hypnosis, the study nevertheless does not support the notion that hypnosis enhances memory. Rather, the present study strongly suggests that if at first you don't remember, don't try hypnosis, don't try imagination, but do try again.

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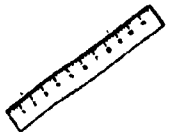
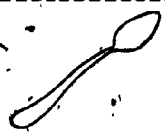
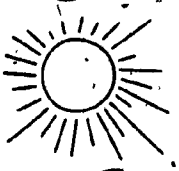
APPENDIX A

Names and Pictures of Stimuli

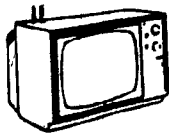
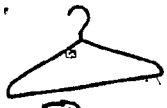
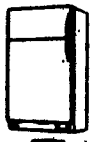
NAMES AND PICTURES OF STIMULI

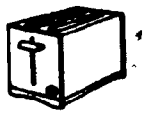
Presentation Number	English Name	French Name	Picture
1	eye	oeil	
2	shirt	chemise	
3	glasses	lunettes	
4	lips	lèvres	
5	orange	orange	
6	key	clef	
7	door	porte	
8	fork	fourchette	
9	tennis racquet	racquette de tennis	
10	leaf	feuille	

Presentation Number	English Name	French Name	Picture
11	apple	pomme	
12	tomato	tomate	
13	bowl	bol	
14	ruler	règle	
15	heart	coeur	
16	banana	banane	
17	pencil	crayon	
18	ear	oreille	
19	belt	ceinture	
20	guitar	guitare	

Presentation Number	English Name	French Name	Picture
21	spoon	cuillère	
22	star	étoile	
23	garbage can	poubelle	
24	broom	balai	
25	button	bouton	
26	sun	soleil	
27	pliers	pinces	
28	cherry	cerise	
29	iron	fer à repasser	
30	tie	cravate	

Presentation Number	English Name	French Name	Picture
31	needle	aiguille	
32	lightbulb	ampoule	
33	telephone	téléphone	
34	foot	pied	
35	scissors	ciseaux	
36	hand	main	
37	potato	patate	
38	cat	chat	
39	traffic light	feu de circulation	
40	comb	peigne	

Presentation Number	English Name	French Name	Picture
41	corn	blé dinde	
42	football	football	
43	lightswitch	switch	
44	book	livre	
45	television	télévision	
46	coat hanger	support	
47	grapes	raisins	
48	refrigerator	réfrigérateur	
49	sock	bas	
50	carrot	carotte	

Presentation Number	English Name	French Name	Picture
51	toaster	grille pain	
52	frying pan	poèle à frire	
53	pear	poire	
54	doorknob	poignée	
55	salt shaker	salière	
56	celery	célerie	
57	nail file	lime à ongles	
58	squirrel	écureuil	
59	bus	autobus	
60	lemon	citron	

APPENDIX B

Informed Consent Form

INFORMED CONSENT FORM

Background Information for Participation in Research Studies in the Hypnosis Laboratory, Department of Psychology

Name:_____

Telephone:_____

The research carried out with volunteer subjects in the Hypnosis Laboratory of the Department of Psychology includes a number of continuing research projects. Our studies are concerned with understanding more about the nature of hypnosis and various hypnotic phenomena. The success of our research depends upon the assistance of volunteers like yourself and we are very grateful for your participation.

Please sign this form after reading the following section:

Today I am volunteering to participate in a research study that will involve watching a series of slides of line-drawings, and answering questions about these pictures; the session may involve hypnosis and other imagery enhancing techniques. My participation will also involve discussing my experiences of and reactions to the study. I understand that I will receive a nominal payment of $8.00 for my participation in today's session.

Signature:_____

Investigator:_____

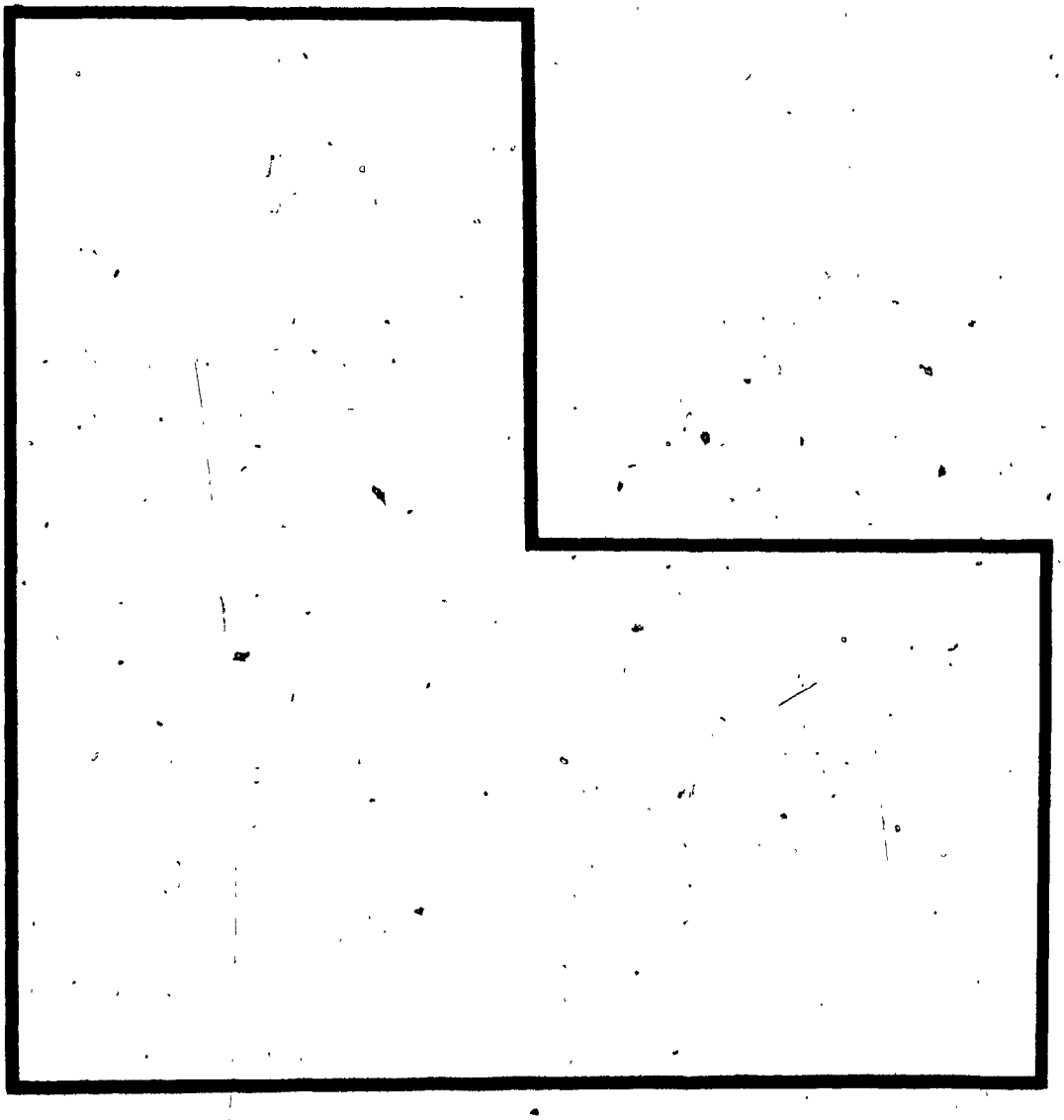
Date:_____

APPENDIX C

Puzzle

PUZZLE

Instructions: During this 15 minute period, please work on the following puzzle. Divide this figure into four (4) identical parts.



APPENDIX D

Response Sheet

RESPONSE SHEET

Items	Rating	Items	Rating	Items	Rating
1. _____	1 2 3	21. _____	1 2 3	41. _____	1 2 3
2. _____	1 2 3	22. _____	1 2 3	42. _____	1 2 3
3. _____	1 2 3	23. _____	1 2 3	43. _____	1 2 3
4. _____	1 2 3	24. _____	1 2 3	44. _____	1 2 3
5. _____	1 2 3	25. _____	1 2 3	45. _____	1 2 3
6. _____	1 2 3	26. _____	1 2 3	46. _____	1 2 3
7. _____	1 2 3	27. _____	1 2 3	47. _____	1 2 3
8. _____	1 2 3	28. _____	1 2 3	48. _____	1 2 3
9. _____	1 2 3	29. _____	1 2 3	49. _____	1 2 3
10. _____	1 2 3	30. _____	1 2 3	50. _____	1 2 3
11. _____	1 2 3	31. _____	1 2 3	51. _____	1 2 3
12. _____	1 2 3	32. _____	1 2 3	52. _____	1 2 3
13. _____	1 2 3	33. _____	1 2 3	53. _____	1 2 3
14. _____	1 2 3	34. _____	1 2 3	54. _____	1 2 3
15. _____	1 2 3	35. _____	1 2 3	55. _____	1 2 3
16. _____	1 2 3	36. _____	1 2 3	56. _____	1 2 3
17. _____	1 2 3	37. _____	1 2 3	57. _____	1 2 3
18. _____	1 2 3	38. _____	1 2 3	58. _____	1 2 3
19. _____	1 2 3	39. _____	1 2 3	59. _____	1 2 3
20. _____	1 2 3	40. _____	1 2 3	60. _____	1 2 3

(Circle: 1 = unsure, 2 = sure, 3 = very sure)

APPENDIX E

Postexperimental Inquiry Form

POSTEXPERIMENTAL INQUIRY FORM

Subject's Name:_____

1. What do you think this study is about?_____

_____

_____

2. What do you think the exact hypothesis is in this experiment? What was I trying to test?

_____

_____

3. Do you think that other Ss may react differently to the experiment from the way you did? Yes/No If yes, in what way?

_____

_____

4. Do you think that the experiment will come out in a particular way? Yes/No If yes, in what way?

_____

_____

5. In your own words, can you describe your reaction to this session?

_____

_____

6. On a scale of 1 to 5, where 1 is not at all helpful and 5 is extremely helpful, how helpful did you find the (hypnosis/imagery task/puzzle) to be for enhancing your memory for the pictures? 1 2 3 4 5

Any comments? _____

_____

_____

APPENDIX F

Verbatim Transcript of Experimental Procedure

VERBATIM TRANSCRIPT OF EXPERIMENTAL PROCEDURE

Study Period

Hypnosis, Imagination, and Control Conditions.

In just a few moments, I am going to show you a series of 60 slides, each containing a line drawing of a common object. Each slide will be projected for 5 seconds. Please study each slide carefully because following presentation of the slides I am going to test your memory for the pictures. Specifically, I am going to ask you to recall as many of the pictured objects as you can. You will have the choice of naming the objects in either English or French. Do you have any questions? Okay, please pay close attention to the slides.

[PRESENT SLIDES]

Period 1

Hypnosis, Imagination, and Control Conditions

In just a moment, I am going to give you a sheet that has spaces for 60 items on it. What I'd like you to do is to write down the names of as many of the pictures as you can remember. As I mentioned, you may write down the names in

either English or French. Also, beside each item, I want you to indicate whether you are unsure, sure, or very sure that each item you name was one of the ones that you saw in the series of slides. It is important that you try to remember as many of the pictures as you can. Even if you feel that you have remembered all the items you can, look over your list and try to think of any other items that you saw. Try to write down as many items as you can. If you are unsure about some items, that is okay; just try to make educated guesses about as many items as possible. You will now have 7 minutes to recall as many items as you can. Although this may seem like a long time; it is important that you keep trying to recall items throughout the entire period. As each minute passes, I will call out the time, and as I do, I want you to circle the number beside the last item that you recalled. Do you have any questions? Okay, please complete this sheet.

[TEST 1]

Hypnosis, Imagination, and Control Conditions

In just a moment, I am going to give you another sheet. Once again, I would like you to write down the names of as many of the pictures as you can remember. Also, I want you again to indicate for each item whether you are unsure, sure, or very sure that each item was among the slides you saw.

Just as before, even if you feel that you have remembered all the items you can, look over your list and try to think of any other items that you saw. Again, even if you are unsure about some items, just try to make educated guesses about as may items as possible. You will have another 7 minutes to write down as many items as you can, and again I will announce each minute as it passes. Please remember to circle the number next to the word that you have just written when I call out the time.

[TEST 2]

Period 2

Hypnosis Condition

In this study I am interested in techniques that help people with your hypnotic ability to improve their memory for visual information like the pictures you saw earlier. The technique that I am especially interested in is hypnosis. This is because recent research has indicated that visual information is stored vividly in memory and that through hypnosis it becomes easier for people to remember such information. In this particular study, I am hoping to show that hypnosis will substantially improve your memory for the pictures that you saw. In a moment, I am going to administer a hypnotic induction procedure. Then, when you are

hypnotized, I will again test your memory for the pictures. Do you have any questions? Okay, please close your eyes and pay close attention to what I say.

[SHSS:C INDUCTION and
CHEVREUL'S PENDULUM DEEPENING PROCEDURE]

Imagination Condition

In this study I am interested in techniques that help people with your hypnotic ability to improve their memory for visual information like the pictures you saw earlier. The technique that I am especially interested in is imagery stimulation. This is because recent research has indicated that visual information is stored vividly in memory and that through imagery stimulation techniques it becomes easier for people to remember such information. In this particular study, I am hoping to show that an imagery stimulation technique will substantially improve your memory for the pictures that you saw. In a moment, I am going to give you a task designed to stimulate your imagery ability. Then, when your imagery ability is stimulated, I will again test your memory for the pictures. The task is a difficult one, but previous research has indicated that it is an excellent way to stimulate recall for visual images. You will have 15 minutes to work on the task. If you arrive at a solution before the 15 minutes are up, ask me for another sheet and

try for another solution. If you do not arrive at a solution before the 15 minutes are up, don't be concerned since research has shown that it is the act of trying to find a solution, rather than getting one, that stimulates imagery in the way that we want. Try to solve the puzzle by imaging, in your mind's eye, the different possible solutions for it. By imaging in this way, your memory for the line drawings will be stimulated. Do you have any questions? Okay, please begin this task.

[PUZZLE]

Control Condition

Okay, I would now like to go on with the next part of the experiment. What I would like you to do now is to work on this puzzle for the next 15 minutes. If you arrive at a solution before the time is up, ask me for another sheet and try for a different solution. The task is a difficult one, so don't be concerned if you do not arrive at a solution before the 15 minutes are up. Do you have any questions? Okay, please attempt to solve this puzzle.

[PUZZLE]

Hypnosis Condition

Now that you are hypnotized, I am again going to test your memory for the pictures that you saw at the beginning of the session. You will find that hypnosis will help you to focus your attention and concentration better so that you can remember many more of those pictures than you did before. You will also find that being hypnotized allows you to picture each item clearly and vividly. Concentrate now on recalling the pictures, and as you do, you will find that the images of those pictures appear effortlessly in your mind's eye. They will come to you even as you begin to think of them now. You will also find that the more items you remember, the easier it will be to remember even more. In a moment, I will give you another sheet for you to write down the names of as many of the 60 pictures as you possibly can. You will find that you can remember many more items than you did previously. Also, you will be able to remember not only all the items that you have recalled on previous attempts, but also many more new items. You will find that hypnosis enables you to remember many more items than you did previously. Once again, as you write down each item, please indicate whether you are unsure, sure, or very sure that item you name is one of the ones you saw. Also, even when you can't seem to remember any more items, look over your list

and try to think of any other items that you saw. Even if you are unsure about some items, don't hesitate to write them down. You will have 7 minutes for this task, and as before, I will tell you as each minute passes so that you can circle the number beside the last item you recalled. Please try to recall both the pictures that you wrote down previously, and any new items.

Imagination Condition

Now that your imagery ability is stimulated, I am again going to test your memory for the pictures that you saw at the beginning of the session. You will find that the imagery task will help you to focus your attention and concentration better so that you can remember many more of those pictures than you did before. You will also find that having your imagery ability stimulated allows you to picture each item clearly and vividly. Concentrate now on recalling the pictures, and as you do, you will find that the images of those pictures appear effortlessly in your mind's eye. They will come to you even as you begin to think of them now. You will also find that the more items you remember, the easier it will be to remember even more. In a moment, I will give you another sheet for you to write down the names of as many of the 60 pictures as you possibly can. You will find that you can remember many more items than you did previously.

Also, you will be able to remember not only all the items that you have recalled on previous attempts, but also many more new items. You will find that the imagery task will enable you to remember many more items than you did previously. Once again, as you write down each item, please indicate whether you are unsure, sure, or very sure that each item you name is one of the ones you saw. Also, even when you can't seem to remember any more items, look over your list and try to think of any other items that you saw. Even if you are unsure about some items, don't hesitate to write them down. You will have 7 minutes for this task, and as before, I will tell you as each minute passes so that you can circle the number beside the last item you recalled. Please try to recall both the pictures that you wrote down previously, and any new items.

Control Condition

Okay, I'd like to test your memory for the pictures again. Here is another sheet for you to write down the names of as many of the 60 pictures as you possibly can. Remember to indicate whether you are unsure, sure, or very sure that each item is one of those you saw in the series of slides. Also, even when you can't seem to remember any more items, don't give up; keep trying to recall the pictures that you wrote down previously and any new items as well.

[TEST 3]

Hypnosis Condition

I am now going to test your memory for the pictures once again. Before I do, however, I want you to notice how easy it is to imagine the pictures because of the hypnosis. And, as you remain in hypnosis, your memory for the pictures will continue to improve, and more and more pictures will come to mind, easily and effortlessly. In fact, you will probably find that your ability to concentrate on the pictures gets better and better all the time. Concentrate on the task of trying to recall the pictures, and as you do, your memory of the pictures becomes clearer and clearer. Here is another sheet for you to write down the names of as many of the 60 pictures as you possibly can. Remember to indicate whether you are unsure, sure, or very sure that each item is one of those you saw in the series of slides. Also, even when you can't seem to remember any more items, look over your list and try to visualize any other items that you saw. Hypnosis will enable you to visualize clearly the items already on your list, and help you to remember even more items. Even if you are unsure about some items, don't hesitate to write them down. You will have 7 minutes for this task, and as before, I will tell you as each minute passes so that you can circle the number beside the last item you recalled. Please try to

recall both the pictures that you wrote down previously and any new items.

Imagination Condition

I am now going to test your memory for the pictures once again. Before I do, however, I want you to notice how easy it is to imagine the pictures because of the imagery stimulation task. And, while your imagery ability remains stimulated, your memory for the pictures will continue to improve, and more and more pictures will come to mind, easily and effortlessly. In fact, you will probably find that your ability to concentrate on the pictures gets better and better all the time. Concentrate on the task of trying to recall the pictures, and as you do, your memory of the pictures becomes clearer and clearer. Here is another sheet for you to write down the names of as many of the 60 pictures as you possibly can. Remember to indicate whether you are unsure, sure, or very sure that each item is one of those you saw in the series of slides. Also, even when you can't seem to remember any more items, look over your list and try to visualize any other items that you saw. With you imagery ability stimulated, visualizing the items already on your list will help you to visualize other items. Even if you are unsure about some items, don't hesitate to write them down. You will have 7 minutes for this task, and as before, I will

tell you as each minute passes so that you can circle the number beside the last item you recalled. Please try to recall both the pictures that you wrote down previously and any new items.

Control Condition

I am now going to test your memory for the pictures once again. Here is another sheet for you to write down the names of as many of the 60 pictures as you possibly can. Remember to indicate whether you are unsure, sure, or very sure that each item is one of those you saw in the series of slides. Also, even when you can't seem to remember any mor items, look over your list and try to think of any other items that you saw. Even if you are unsure about some items, don't hesitate to write them down. You will have 7 minutes for this task, and as before, I will tell you as each minute passes so that you can circle the number beside the last item you recalled. Please try to recall both the pictures that you wrote down previously and any new items.

[TEST 4]

Period 3

Hypnosis Condition

In a moment, I am going to count from 10 to 1. As I do, you will come out of hypnosis feeling refreshed and relaxed. An interesting thing will also happen. You will find that your memory for the pictures will continue to get better and better, even after you are fully awake. In fact, you will find that your memory of the pictures will get clearer and clearer every time you try to recall them. Each time that you try to recall them, you will probably remember even more items. Even without any special effort, just thinking about some of the pictures will help you remember other items, including items that you have not recalled previously. You may even recall all of the pictures that you saw at the beginning of the session. I am now going to count from 10 to 1. 10...9...8...7...6...5...4...3...2...1. Wide awake now. How do you feel? Okay, I am going to test your memory for the pictures again. In a moment, I'll give you another sheet for you to write down the names of as many of the 60 pictures as possible, indicating whether you are unsure, sure, or very sure that the items you are naming were among the slides you saw. You will have the usual 7 minutes to remember as many of the pictures as you can. As I call out each minute, please remember to circle the number beside the last item

recalled. It is important that you keep trying to visualize the pictures. Even if you think that you have recalled all the items that you can, look over your list and see if you can remember both the pictures that you have recalled previously as well as any new items.

Imagination Condition

An interesting thing about imagery stimulation tasks such as the puzzle you worked on is that their effects persist for quite awhile. In fact, you will find that your memory for the pictures continues to get better and better. And so, you will probably find that you can remember even more items the next time you try. Even without any special effort, just thinking about some of the pictures will help you to remember other items, including items that you have not recalled previously. You may even recall all the pictures that you saw at the beginning of the session. Okay, I am going to test your memory for the pictures once again. In a moment, I'll give you another sheet for you to write down the names of as many of the 60 pictures as possible, indicating for each item whether you are unsure, sure, or very sure that the items you are naming were among the slides you saw. You will have the usual 7 minutes to remember as many of the pictures as you can. As I call out each minute, please remember to circle the number beside the last item

recalled. It is important that you keep trying to visualize the pictures. Even if you think that you have recalled all the items that you can, look over your list and see if you can remember both the pictures that you have recalled previously as well as any new items.

Control Condition

Okay, I am going to test your memory for the pictures once again. But before I do, however, is there anything else you might like to mention about the strategies you used to solve the puzzle? In a moment, I'll give you another sheet for you to write down the names of as many of the 60 pictures as possible, indicating for each item whether you are unsure, sure, or very sure that the items you are naming were among the slides you saw. You will have the usual 7 minutes to remember as many of the pictures as you can. As I call out each minute, please remember to circle the number beside the last item recalled. Even if you think that you have recalled all the items that you can, keep trying to remember throughout the entire period and see if you can recall both the pictures that you have recalled previously as well as any new items.

[TEST 5]

Hypnosis, Imagination, and Control Conditions

I would now like to do a final recall test. In a moment, I will give you another sheet for you to write down the names of as many of the 60 pictures as you can remember, indicating whether you are unsure, sure, or very sure that each of the the items you have named was one of the ones you saw. If you are unsure about some items, make educated guesses. You will have 7 minutes for this final recall, and as in all previous trials, please circle the number beside the last item recalled as I call out the passing of each minute. It is important that you keep trying to remember the pictures, even if you think that you have recalled all the items you can. Further, try to recall both the pictures that you remembered previously and any new items that you are recalling for the first time.

[TEST 6]

APPENDIX G

Raw Data

1. Key to Coded Subject Variables
2. Subject Variables
3. Total Correct and Incorrect Items
4. Cumulative Correct and Incorrect Items
5. Confidence Ratings of Total Correct and Incorrect Items
6. Cumulative "Confident Errors"

Key to Coded Subject Variables

Hypnotizability

0 = Low

1 = High

Test Condition

1 = Hypnosis

2 = Imagination

3 = Control

Subject Variables

Subject Number a	Hypnotizability b	Test Condition c	Sex	Age	HGSHS:A	SHSS:C
1	0	2	M	32	2	0
2	1	1	F	36	9	10
3	0	1	F	23	0	3
4	1	1	F	21	9	11
5	1	2	M	29	10	10
6	1	2	F	19	12	11
7	1	1	F	23	11	11
8	1	1	M	36	10	10
9	0	1	M	28	0	2
10	0	1	M	21	3	3
11	2	2	M	20	11	11
12	1	2	F	36	10	10
13	1	1	M	25	10	11
14	0	2	F	21	0	2
15	0	2	M	25	0	1
16	1	2	F	20	11	12
17	0	1	F	19	0	0
18	0	2	F	20	2	2
19	0	3	F	36	0	0
20	1	3	M	20	10	10
21	1	3	F	19	10	10
22	1	1	M	25	12	12
23	1	2	F	22	9	12
24	1	1	F	23	10	12
25	0	3	F	20	3	3
26	1	3	F	53	11	11
27	1	2	M	22	12	10
28	1	3	F	21	12	12
29	1	3	F	20	12	10
30	1	3	F	23	10	10
31	1	3	M	21	10	10
32	1	1	F	24	10	11
33	1	3	M	22	10	10
34	1	2	F	20	10	10
35	0	1	F	23	2	3
36	0	2	F	20	0	1
37	0	3	F	20	0	0
38	0	2	F	19	2	1
39	0	3	M	34	0	0
40	0	3	F	19	1	1
41	0	3	M	41	1	1
42	0	1	F	19	1	1
43	0	1	F	20	0	0
44	0	3	M	20	1	1
45	0	3	F	25	0	0
46	0	2	F	23	1	1
47	1	1	M	24	0	0
48	0	2	M	20	2	2

Total Correct and Incorrect Items

Subject I.D.			Correct						Incorrect					
			Recall Test						Recall Test					
a	b	c	1	2	3	4	5	6	1	2	3	4	5	6
1	0	2	31	33	36	37	36	37	00	00	00	00	01	02
2	1	1	33	37	35	38	40	38	04	05	03	07	09	11
3	0	1	32	36	39	43	44	42	00	01	05	04	04	07
4	1	1	29	29	29	31	32	32	07	12	16	20	22	17
5	1	2	33	36	35	40	45	46	04	08	15	13	12	11
6	1	2	22	24	29	29	28	31	01	02	03	05	06	11
7	1	1	24	23	23	19	21	24	02	04	02	04	02	04
8	1	1	33	33	31	35	35	35	04	05	05	04	06	05
9	0	1	20	21	22	24	23	23	00	00	00	00	00	00
10	0	1	29	30	32	31	31	29	02	01	02	02	03	03
11	1	2	34	35	37	36	35	35	02	01	01	01	01	02
12	1	2	41	43	43	42	46	44	00	01	01	01	02	02
13	1	1	24	21	26	31	29	30	02	04	07	07	07	14
14	0	2	34	36	38	39	41	41	00	00	00	01	01	01
15	0	2	30	34	34	37	34	35	01	00	01	00	02	02
16	1	2	34	39	39	40	40	44	00	00	04	04	07	09
17	0	1	28	32	33	33	34	33	03	01	07	06	09	15
18	0	2	43	42	43	44	46	45	00	01	01	03	06	04
19	0	3	30	32	36	35	35	37	07	09	12	12	19	19
20	1	3	31	32	32	36	34	33	05	02	04	04	03	02
21	1	3	39	41	46	45	50	48	00	00	00	00	00	00
22	1	1	23	30	32	30	30	30	01	02	03	04	07	00
23	1	2	25	27	33	34	33	34	01	00	02	03	02	02
24	1	1	36	39	41	41	44	44	00	00	00	00	02	01
25	0	3	30	32	36	38	36	37	00	00	03	03	03	02
26	1	3	27	32	38	39	39	40	01	00	01	01	01	01
27	1	2	20	25	23	23	24	28	04	05	04	07	10	13
28	1	3	37	36	40	40	43	43	00	00	01	01	01	01
29	1	3	30	31	35	34	35	34	01	00	01	01	02	01
30	1	3	33	34	37	38	38	41	01	03	04	05	05	04
31	1	3	24	30	28	32	31	35	00	00	02	02	00	03
32	1	1	39	47	46	46	46	48	00	01	02	02	02	01
33	1	3	31	31	35	37	35	37	01	02	05	05	06	08
34	1	2	35	37	45	46	45	45	00	00	00	00	00	00
35	0	1	36	39	41	44	47	50	02	00	01	01	00	01
36	0	2	34	35	37	39	41	42	00	00	02	02	02	05
37	0	3	41	41	41	39	41	44	01	01	01	01	01	01
38	0	2	32	36	37	39	39	39	01	01	01	01	01	01
39	0	3	27	32	32	33	33	33	00	00	01	02	03	02
40	0	3	30	30	37	36	38	38	01	01	01	01	02	02
41	0	3	35	34	35	39	40	43	01	01	03	02	03	03
42	0	1	40	48	53	53	53	52	00	00	00	00	02	02
43	0	1	37	39	47	46	50	49	01	01	01	01	01	01
44	0	3	30	30	40	44	43	42	00	00	01	01	02	02
45	0	3	36	36	37	35	41	42	01	01	01	01	01	01
46	0	2	25	28	25	29	30	30	01	05	03	01	02	02
47	1	1	17	19	23	27	29	27	02	04	06	05	09	08
48	0	2	37	33	41	42	42	43	00	00	00	00	01	02

Cumulative Correct and Incorrect Items

Subject I.D.			Correct						Incorrect					
			Recall Test						Recall Test					
a	b	c	1	2	3	4	5	6	1	2	3	4	5	6
1	0	2	31	33	38	39	48	48	00	00	00	00	01	02
2	1	1	33	38	41	45	46	46	04	06	07	10	14	16
3	0	1	32	39	43	45	47	47	00	01	05	07	07	09
4	1	1	29	34	37	38	39	39	07	17	26	33	37	41
5	1	2	33	40	41	45	46	46	04	09	18	21	23	24
6	1	2	22	27	33	35	37	38	01	02	04	06	09	13
7	1	1	24	26	27	28	28	32	02	05	06	07	07	08
8	1	1	33	34	34	35	36	36	04	07	07	07	09	09
9	0	1	20	22	22	24	24	24	00	00	00	00	00	00
10	0	1	29	32	34	35	35	35	02	02	03	04	04	04
11	1	2	34	36	39	40	41	42	02	02	02	02	02	03
12	1	2	41	43	43	44	47	47	00	01	02	02	02	02
13	1	1	24	27	34	37	38	38	02	04	09	10	13	18
14	0	2	34	39	41	42	44	45	00	00	00	01	01	01
15	0	2	38	35	37	40	40	41	01	01	01	01	02	02
16	1	2	34	40	40	41	42	46	00	00	04	05	08	11
17	0	1	28	32	34	36	37	39	03	03	10	12	14	18
18	0	2	43	45	46	48	49	49	00	01	01	03	06	07
19	0	3	30	32	37	37	38	39	07	09	14	16	22	25
20	1	3	31	35	36	38	38	38	05	05	05	07	07	07
21	1	3	39	42	46	48	52	53	00	00	00	00	00	00
22	1	1	23	31	34	34	34	35	01	02	04	06	09	12
23	1	2	25	29	35	35	36	37	01	01	03	03	03	03
24	1	1	36	39	43	44	48	49	00	00	00	00	02	02
25	0	3	30	36	40	40	40	40	00	00	03	03	03	03
26	1	3	27	34	39	41	43	43	01	01	02	02	02	02
27	1	2	20	25	26	26	29	30	04	05	06	09	15	20
28	1	3	37	39	41	44	47	47	00	00	01	01	01	01
29	1	3	30	34	38	39	40	41	01	01	02	02	03	03
30	1	3	33	37	41	42	43	45	01	03	05	06	06	06
31	1	3	24	32	34	37	37	37	00	00	02	03	03	05
32	1	1	39	48	49	49	49	49	00	01	02	02	02	02
33	1	3	31	35	37	40	41	41	01	02	05	07	08	11
34	1	2	35	41	46	48	48	48	00	00	00	00	00	00
35	0	1	36	41	44	46	49	50	02	02	02	02	02	02
36	0	2	34	36	39	42	45	47	00	00	02	04	04	07
37	0	3	41	42	42	43	44	44	01	01	01	01	01	01
38	0	2	32	36	39	40	41	41	01	01	01	01	01	01
39	0	3	27	33	34	35	36	36	00	00	01	02	03	03
40	0	3	30	35	39	39	41	43	01	01	01	01	02	02
41	0	3	35	39	41	43	44	46	01	02	04	05	06	07
42	0	1	48	49	53	53	55	55	00	00	00	00	02	02
43	0	1	37	41	47	47	50	50	01	01	01	01	01	01
44	0	3	30	40	43	45	46	46	00	00	01	02	03	03
45	0	3	36	37	40	40	42	43	01	01	01	01	01	01
46	0	2	25	31	32	35	38	38	01	05	05	05	05	05
47	1	1	17	22	27	28	29	29	02	05	08	09	12	13
48	0	2	37	40	46	47	47	48	00	00	00	00	01	02

Confidence Ratings of Total Correct and Incorrect Items

Subject I.D.			Correct						Incorrect					
			Recall Test						Recall Test					
a	b	c	1	2	3	4	5	6	1	2	3	4	5	6
1	0	2	3.00	3.00	2.97	3.00	2.94	2.95	-	-	-	-	1.00	1.00
2	1	1	3.00	2.94	3.00	3.00	3.00	3.00	1.00	1.20	1.33	2.28	2.44	2.45
3	0	1	3.00	3.00	3.00	3.00	3.00	3.00	-	1.00	1.00	1.00	1.00	1.00
4	1	1	3.00	3.00	3.00	2.94	3.00	3.00	1.43	1.25	1.88	1.65	1.32	1.35
5	1	2	2.88	2.86	2.94	2.90	2.87	2.91	1.00	1.13	1.40	1.38	1.33	1.64
6	1	2	2.86	2.88	2.90	2.90	2.82	2.94	2.00	1.50	1.00	1.40	1.17	1.09
7	1	1	2.92	2.91	3.00	3.00	2.90	3.00	1.00	1.00	1.00	1.00	1.00	1.00
8	1	1	3.00	3.00	3.00	3.00	3.00	3.00	2.25	2.60	3.00	2.75	2.50	2.60
9	0	1	3.00	2.95	3.00	3.00	3.00	3.00	-	-	-	-	-	-
10	0	1	2.96	2.93	3.00	3.00	3.00	2.97	2.00	2.00	2.00	2.00	1.67	1.33
11	1	2	2.94	2.94	3.00	3.00	2.97	2.94	3.00	3.00	3.00	3.00	3.00	2.00
12	1	2	2.95	2.91	2.93	2.93	2.93	2.93	-	1.00	1.00	1.00	1.00	1.00
13	1	1	3.00	3.00	3.00	3.00	3.00	3.00	3.00	2.75	3.00	3.00	3.00	2.57
14	0	2	3.00	3.00	3.00	2.95	2.95	2.90	-	-	-	1.00	1.00	1.00
15	0	2	2.97	2.91	2.88	2.84	2.85	2.88	2.00	-	2.00	-	1.50	1.50
16	1	2	2.94	2.92	2.92	2.92	2.90	2.93	-	-	1.00	1.00	1.00	1.00
17	0	1	2.96	2.94	2.94	2.97	2.88	2.82	1.00	1.00	1.28	1.33	1.22	1.33
18	0	2	3.00	2.93	2.95	2.87	2.91	2.91	-	2.00	2.00	1.33	1.33	2.00
19	0	3	3.00	3.00	3.00	3.00	3.00	3.00	1.57	1.33	1.33	1.00	1.16	1.21
20	1	3	3.00	2.97	3.00	3.00	2.97	2.97	1.00	2.50	2.25	2.50	2.33	3.00
21	1	3	2.95	3.00	3.00	2.96	2.96	2.98	-	-	-	-	-	-
22	1	1	2.83	2.78	2.75	2.87	2.90	2.93	1.00	1.50	2.00	1.75	1.86	2.00
23	1	2	2.96	2.93	2.88	2.94	2.91	2.88	2.00	-	2.50	2.00	1.50	1.50
24	1	1	3.00	3.00	2.98	3.00	3.00	2.98	-	-	-	-	1.00	1.00
25	0	3	2.88	2.91	2.86	2.86	2.88	2.84	-	-	2.33	1.67	1.67	1.00
26	1	3	2.92	2.97	2.89	2.97	3.00	3.00	2.00	-	2.00	3.00	3.00	2.00
27	1	2	2.78	2.68	2.96	2.91	2.87	2.78	2.50	2.20	2.50	2.00	1.68	1.54
28	1	3	2.89	2.97	2.98	2.98	2.93	2.95	-	-	1.00	1.00	1.00	1.00
29	1	3	2.98	2.84	2.91	2.94	2.97	2.97	1.00	-	2.00	2.00	2.00	3.00
30	1	3	2.91	2.94	2.86	2.89	2.89	2.93	1.00	1.00	1.25	1.60	2.00	1.75
31	1	3	2.96	2.97	2.96	2.97	2.97	2.91	-	-	1.50	1.50	-	1.00
32	1	1	3.00	3.00	3.00	3.00	3.00	3.00	-	1.00	1.00	1.50	1.50	3.00
33	1	3	3.00	2.98	2.97	2.88	2.97	2.94	3.00	1.50	1.67	1.00	1.33	1.25
34	1	2	2.97	2.92	2.91	2.94	2.96	2.93	-	-	-	-	-	-
35	0	1	2.89	2.98	3.00	3.00	3.00	3.00	1.50	-	2.00	2.00	-	2.00
36	0	2	2.97	2.94	2.94	2.85	2.98	2.98	-	-	2.00	1.00	2.00	2.33
37	0	3	2.98	2.95	2.95	2.95	2.97	2.98	2.95	3.00	3.00	3.00	3.00	3.00
38	0	2	3.00	3.00	2.94	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
39	0	3	2.92	2.97	2.88	2.88	2.82	2.82	-	-	1.00	1.00	1.00	1.00
40	0	3	2.98	2.87	2.89	2.86	2.82	2.74	1.00	1.00	1.00	1.00	1.00	1.00
41	0	3	2.86	3.00	2.94	2.95	2.85	2.91	1.00	1.00	1.67	1.00	1.00	1.67
42	0	1	2.98	3.00	3.00	3.00	3.00	3.00	-	-	-	-	2.00	3.00
43	0	1	2.86	2.98	2.87	2.89	2.74	2.87	3.00	3.00	3.00	3.00	3.00	3.00
44	0	3	3.00	3.00	3.00	3.00	3.00	3.00	-	-	3.00	1.00	1.00	1.00
45	0	3	3.00	3.00	3.00	3.00	2.95	2.95	1.00	1.00	1.00	1.00	1.00	1.00
46	0	2	2.00	2.78	2.92	2.98	2.83	2.87	3.00	1.00	3.00	3.00	3.00	2.50
47	1	1	2.78	2.79	2.78	2.67	2.66	2.74	1.00	1.00	1.00	1.00	1.00	1.00
48	0	2	2.86	2.94	2.98	2.98	2.98	2.91	-	-	-	-	1.00	1.00

Cumulative "Confident Errors"

Subject I.D. _____

a	b	c	Recall Test 1	2	3	4	5	6
1	0	2	00	00	00	00	00	00
2	1	1	00	00	00	03	07	09
3	0	1	00	00	00	00	00	00
4	1	1	01	02	05	07	09	09
5	1	2	00	00	01	02	03	04
6	1	2	00	00	00	00	00	00
7	1	1	00	00	00	00	00	00
8	1	1	02	04	06	06	07	08
9	0	1	00	00	00	00	00	00
10	0	1	01	01	02	02	02	02
11	1	2	02	02	02	02	02	02
12	1	2	00	00	00	00	00	00
13	1	1	02	03	09	10	13	14
14	0	2	00	00	00	00	00	00
15	0	2	00	00	00	00	00	00
16	1	2	00	00	00	00	00	00
17	0	1	00	00	01	01	01	01
18	0	2	00	00	00	00	01	01
19	0	3	01	01	02	02	03	03
20	1	3	00	01	01	02	02	02
21	1	3	00	00	00	00	00	00
22	1	1	00	00	00	01	01	04
23	1	2	00	00	01	01	01	01
24	1	1	00	00	00	00	00	00
25	0	3	00	00	02	02	02	02
26	1	3	00	00	00	01	01	01
27	1	2	03	04	04	04	04	04
28	1	3	00	00	00	00	00	00
29	1	3	00	00	00	00	01	01
30	1	3	00	00	00	01	02	02
31	1	3	00	00	00	00	00	00
32	1	1	00	00	00	00	00	01
33	1	3	01	01	01	01	01	01
34	1	2	00	00	00	00	00	00
35	0	1	00	00	00	00	00	00
36	0	2	00	00	01	01	02	02
37	0	3	01	01	01	01	01	01
38	0	2	01	01	01	01	01	01
39	0	3	00	00	00	00	00	00
40	0	3	00	00	00	00	00	00
41	0	3	00	00	01	01	01	01
42	0	1	00	00	00	00	01	02
43	0	1	01	01	01	01	01	01
44	0	3	00	00	01	01	01	01
45	0	3	00	00	00	00	00	00
46	0	2	01	02	03	03	03	03
47	1	1	00	00	00	00	00	00
48	0	2	00	00	00	00	00	00

APPENDIX H

Analysis of Variance Source Tables for
Tables 1 - 10

Table 1

Mean Number of Total Correct Items

Source	SS	df	MS	F	p
Subject Grouping	163.50	1	163.50	.62	.4345
Test Condition	178.84	2	89.42	.34	.7133
SG x TC	49.05	2	24.52	.09	.9110
Error	11028.69	42	262.59		
Recall Test	1702.06	5	340.41	82.03	.0001
RT x SG	9.56	5	1.91	.46	.8052
RT x TC	10.08	10	1.01	.24	.9914
RT x SG x TC	74.70	10	7.47	1.80	.0622
Error	871.44	210	4.15		

Table 2

Mean Number of Total Incorrect Items

Source	SS	df	MS	F	p
Subject Grouping	153.12	1	153.12	2.47	.1236
Test Condition	148.52	2	74.26	1.20	.3121
SG x TC	207.27	2	103.64	1.67	.2003
Error	2604.92	42	62.02		
Recall Test	370.79	5	74.16	23.79	.0001
RT x SG	14.33	5	2.87	.92	.4691
RT x TC	26.31	10	2.63	.84	.5867
RT x SG x TC	37.64	10	3.76	1.21	.2874
Error	654.58	210	3.12		

Table 3

Mean Number of Cumulative Correct Items

Source	SS	df	MS	F	p
Subject Grouping	46.72	1	46.72	.20	.6564
Test Condition	174.14	2	87.07	.37	.6901
SG x TC	69.05	2	34.52	.15	.8626
Error	9773.08	42	232.69		
Recall Test	3969.46	5	793.89	293.53	.0001
RT x SG	3.32	5	.66	.24	.9421
RT x TC	3.90	10	.39	.14	.9991
RT x SG x TC	22.41	10	2.24	.33	.6042
Error	569.92	210	2.71		

Table 4

Mean Number of Cumulative Incorrect Items

Source	SS	df	MS	F	p
Subject Grouping	452.50	1	452.50	3.20	.0808
Test Condition	460.46	2	230.23	1.63	.2084
SG x TC	374.09	2	187.04	1.32	.2772
Error	5937.94	42	141.38		
Recall Test	1144.81	5	228.96	32.96	.0001
RT x SG	90.14	5	18.03	2.60	.0266
RT x TC	94.28	10	9.42	1.36	.2022
RT x SG x TC	88.33	10	8.83	1.27	.2483
Error	1458.94	210	6.95		

Table 5

Mean Proportion of Cumulative Correct Items

Source	SS	df	MS	F	p
Subject Grouping	.159	1	.159	3.64	.0633
Test Condition	.176	2	.088	2.02	.1453
SG x TC	.105	2	.052	1.20	.3102
Error	1.834	42	.044		
Recall Test	.277	5	.0554	44.21	.0001
RT x SG	.015	5	.0029	2.35	.0425
RT x TC	.015	10	.0015	1.21	.2876
RT x SG x TC	.014	10	.0014	1.09	.3736
Error	.263	210	.0012		

Table 6

Mean Proportion of Cumulative Incorrect Items

Source	SS	df	MS	F	p
Subject Grouping	.159	1	.159	3.64	.0633
Test Condition	.176	2	.088	2.02	.1453
SG x TC	.105	2	.052	1.20	.3102
Error	1.834	42	.044		
Recall Test	.277	5	.0554	44.21	.0001
RT x SG	.015	5	.0029	2.35	.0425
RT x TC	.015	10	.0015	1.21	.2876
RT x SG x TC	.014	10	.0014	1.09	.3736
Error	.263	210	.0012		

Table 7

Mean Confidence of Total Correct Items

Source	SS	df	MS	F	p
Subject Grouping	.012	1	.012	.53	.4704
Test Condition	.048	2	.024	1.09	.3445
SG x TC	.044	2	.022	1.00	.3750
Error	.930	42	.022		
Recall Test	.009	5	.0017	1.10	.3593
RT x SG	.029	5	.0058	3.73	.0030
RT x TC	.015	10	.0015	.96	.4776
RT x SG x TC	.016	10	.0016	1.02	.4276
Error	.328	210	.0016		

Table 8

Mean Confidence of Total Incorrect Items

Source	SS	df	MS	F	p
Subject Grouping	.86	1	.86	.26	.6156
Test Condition	10. 10	2	5.05	1.52	.2449
SG x TC	8.86	2	4.43	1.34	.2876
Error	58.68	18	3.32		
Recall Test	.54	5	.11	.95	.4501
RT x SG	.06	5	.01	.10	.9909
RT x TC	1.15	10	.12	1.03	.4278
RT x SG x TC	1.08	10	.11	.96	.4816
Error	10.09	90	.11		

Table 9

Mean Number of Cumulative "Confident Errors"

Source	SS	df	MS	F	p
Subject Grouping	56.89	1	56.89	3.99	.0521
Test Condition	68.78	2	34.39	2.41	.1017
SG x TC	97.53	2	48.76	3.42	.0419
Error	598.12	42	14.24		
Recall Test	74.65	5	14.93	17.05	.0001
RT x SG	20.53	5	4.10	4.69	.0004
RT x TC	32.64	10	3.26	3.73	.0001
RT x SG x TC	42.30	10	4.23	4.83	.0001
Error	183.88	210	.88		

Table 10

Mean Ratings of Helpfulness of Experimental Manipulation

Source	SS	df	MS	F	p
Subject Grouping	.083	1	.083	.10	.7534
Test Condition	23.62	2	11.81	14.18	.0001
SG x TC	4.29	2	2.14	2.58	.0881
Error	35.00	42	.83		