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ACCURACY OF EYEWITNESS MEMORY UNDER LEADING QUESTIONING:
THE EFFECTS OF HYPNOSIS AND ANXIETY

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Hypnosis has gained substantial support in the psychological community, as well as related health professions. The intense renewal of interest in hypnosis has also affected our legal-judicial system. Many police investigators trained in hypnosis operate from an exact-copy memory theory. They claim eyewitness retrieve veridically stored memory traces from long-term memory, if questioned under hypnosis. Conversely, other researchers ascribe to a reconstructive memory theory. They believe hypnosis increases the likelihood of eliciting erroneous memories from eyewitnesses, especially under leading questioning.

The purpose of the present investigation was to test the effects of hypnotic induction and anxiety on the accuracy of subjects' memory for eyewitnessed events when questioned with leading, non-leading, and embedded misinformation questions. Forty undergraduates (20 males, 20 females) were randomly assigned to one of four conditions: hypnosis procedure--low-anxiety film, hypnosis procedure--high-anxiety film, non-hypnosis procedure--low-anxiety

film, non-hypnosis procedure--high-anxiety film. All subjects completed the anxiety scale from forms A and B of the Eight State Questionnaire and were shown either a low- or high-anxiety film. One-half of the subjects were taken through a direct hypnotic induction procedure and the other half listened to a brief article about hypnosis which was read aloud by an experimenter. Finally, all subjects were asked to respond to a 20-item questionnaire. The results showed a significant interaction between the hypnosis procedure and question format. Hypnosis procedure subjects scored significantly less accurately on embedded misinformation questions than non-hypnosis subjects. No significant differences were found for anxiety levels or confidence ratings. Overall, the results were congruent with the reconstructive memory theory, and it was concluded the hypnosis procedure produced no beneficial effects on memory for eyewitnessed events.

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ACCURACY OF EYEWITNESS MEMORY UNDER LEADING QUESTIONING:
THE EFFECTS OF HYPNOSIS AND ANXIETY

Hypnosis currently enjoys substantial attention as a scientific psychological phenomenon among psychologists (Kraft & Rodolfa, 1982), psychiatrists, and many other health related professions. Evidence of this exists in the increasing number of training and research activities of national and international societies, recognition by major professional associations, and the growing body of publications in both hypnosis and general scientific journals. In fact, among psychologists, Kraft and Rodolfa's (1982) survey indicates that 47 per cent of the general American Psychological Association (APA) membership and practically all of Division 30 members have had some training in hypnosis. In addition, over one-half of Division 30 members and nine per cent of the general APA membership respondents have conducted research in hypnosis. Therapeutically, hypnosis is used in a variety of clinical applications. More specifically, over one-third of psychologists who practice counseling or psychotherapy treat an average of one or more clients per month with hypnosis. Overall, it appears that mental health professionals, particularly psychologists and psychiatrists, are substantially invested in the application and research of hypnosis.

This intense renewal of interest in the application of hypnosis has occurred during the past two decades, spanning all branches of medicine (Kroger, 1977) and psychology as well as significantly impacting our legal-judicial system (Block, 1976; Kroger, 1977; Reiser, 1974; Salzberg, 1977; Schafer & Rubio, 1978). The use of hypnosis in our legal-judicial system is most applicable to the present investigation. Before the relevant literature is reviewed and the research problem is stated, a theoretical and historical overview of hypnosis is given.

Early History of Hypnosis

Many historians relate the emergence of hypnosis during the 18th century to the physician faith healer Franz Anton Mesmer, whose "magnetic" treatments in 1774 marked the beginning of "scientific research" on hypnosis. However, the history of hypnosis goes back to antiquity, and hypnosis has been practiced under numerous names in diverse cultures. Witch doctors, religious leaders, and tribal medicine men have used hypnotic and suggestive procedures with tremendous pragmatic effectiveness (Fromm & Shor, 1979; Kroger, 1977). The Ebers papyrus, over 3000 years old, describes how Egyptian soothsayers used hypnotic methods similar to those currently practiced. Several hundred years past, Greek oracles, Hindu fakirs, Persian magi, and Indian yogi used hypnosis-like procedures for faith healing and for magico-religious purposes. Similar occurrences have been

documented among African tribes and American Indian witch doctors.

Evidence of quasi-hypnotic techniques such as the laying on of hands is found in the Bible and the Talmud (Kroger, 1977). Several religions have used the power of touch and prayer for healing purposes. For many centuries, particularly during the Middle Ages, kings and princes, through their divine right, were believed to control the power of healing through the "Royal Touch."

During the 17th century, famous healers like Valentine Greatrakes (1628-1666), the "great Irish stroaker," and Francisco Bagnone of Italy attracted huge followings. They had only to touch the sick with their hands or some relic to effect their cures.

The presumed healing effects of astral bodies and magnetic forces was first demonstrated by Paracelsus (1493-1541). His theories and methods of harnessing animal magnetism from the heavens were supported and elaborated upon by many during the 17th and 18th centuries, but all proclaimed the same hypothesis--that the magnet could cure most diseases. Later in the early 18th century, an English physician, Richard Mead (1673-1754), attempted to explain living systems by natural laws, after having been inspired by the research of his patient, Sir Isacc Newton.

Modern History of Hypnotism

The modern history of hypnotism beginning with Mesmer and continuing into the present can be separated into four periods. These four periods include Presomnambulistic Mesmerism, Somnambulistic Mesmerism (later called hypnosis), the Early Psychological Period, and the Modern Psychological Period (Fromm & Shor, 1979). Each of these periods will be reviewed in turn to elucidate the emergence, development, and current status of hypnosis.

Presomnambulistic Mesmerism. Mesmer (1734-1815) apparently plagiarized and used Mead's theory in developing his universal fluid hypothesis (Kroger, 1977). Mesmer later refined his hypothesis and treatment in 1771 after borrowing Father Maximilian Hell's ideas of magnetic cures obtained by applying steel plates to the naked body. To facilitate the treating of the large crowds that were eventually attracted to him and his methods, Mesmer invented the baquet. This large tub filled with iron filings and protruding iron rods made it possible for more than 30 patients at a time to receive the "magnetic flow" by grasping the rods and being touched by Mesmer with a glass rod. Many of his earlier patients developed convulsive seizures or other similar "crises" during their treatment, before being cured (Fromm & Shor, 1979). Mesmer, his disciples, and their patients soon became convinced that these crises were indispensable if a cure was to follow. Mesmer quickly maintained that the

power of animal magnetism emanated directly from himself to the patient through his magnetic wand, instead of from astral bodies.

Mesmer's influence occurred during an age of fanatic ultrarationalism, when orthodox physicians had little to offer patients of functional illnesses other than impersonal faith healing using potions, purging, and bleeding (Bramwell, 1956). Conversely, Mesmer's form of faith healing was highly personalized and attuned to the emotional needs of the masses, enlisting their enthusiastic belief complete with high expectations of being cured. Mesmer realized the importance of expectation in noting that his patients were cured only if they cooperated and truly wished to be cured. By enlisting his patients' intense desire for cures and their strong anticipation, Mesmer and his assistant d'Eslon finely honed their theatrical art of heightening the expectancy of the crisis and cure. However, these claims compounded with his tremendous success and following soon led to his downfall and ostracism by the French medical profession, following their determination that the cures were due to mere imagination, and therefore nothing but fraud and collusion.

Somnambulistic Mesmerism. During 1784, the same year that the Royal Commissioners disproved the existence and value of Mesmer's animal magnetism, one of his layman disciples, Armand Chastenet, Marquis de Puysegur, outlined

his discovery of artificial somnambulism--the first clear recognition of the significance of mesmerically induced sleepwalking (Pattie, 1956). Puysegur's emphasis on artificial somnambulism and the shift away from the convulsive crises ushered in the second period of the scientific development of hypnotism (Fromm & Shor, 1979).

Puysegur and his students found that during somnambulism, mesmerized individuals could speak clearly, open their eyes and move about freely, respond to the mesmerist's commands, and afterwards demonstrate amnesia for these experiences. He successfully treated hundreds of peasants and villagers who were isolated from the intellectual Parisian rumors about what to expect during mesmeric treatment. Somnambulism was accomplished outdoors without mysticism and theatrics, as when Puysegur accumulated animal magnetism in a tree with consequent somnambulistic effects.

Puysegur's discovery of this induced trance state yielded vigorous experimentation by him and his followers. Soon all the hypnotic phenomena known and practiced today were discovered: catalepsies, amnesias, anesthetics, positive and negative hallucinations, motor automatisms, posthypnotic phenomena, trance depth, and varying degrees of susceptibility (Fromm & Shor, 1979; Pattie, 1956).

James Baid introduced another second-period theory of mesmeric phenomena resulting in significant historic import

in his book Neurypnology, published in 1843. While agreeing that some mesmeric experiences were real, he denied all mesmeric theories postulating the importance of external influences. Instead, Braid proposed a naturalistic physiological explanation after experimenting with the eye fixation induction method. He reasoned that staring fixedly at some bright object for an extended period produces fatigue of the levator muscles of the eyelids, resulting in general fatigue of the nerve centers. Braid termed the resultant nervous sleep or stupor "neuro-hypnotism," emphasizing the importance he placed on physiological factors. Four years later he revised his views by giving more credence to psychological factors because he believed that the degree of expectation increased the subject's susceptibility to induction and suggestion (Kroger, 1977). Eventually, he concluded that hypnosis could be induced without a formal induction, and the altered state of consciousness he had mislabeled "hypnosis" (hypnos--Greek for sleep) was in fact not sleep. But this very important change from the misnomer mesmerism to the misnomer hypnotism resulted in positive changes in the public and professional views of the phenomenon.

Three decades later, in 1878, Jean Martin Charcot, a famous clinical neurologist, demonstrated hypnotism at the Salpetriere Hospital in Paris. He espoused a theory of hypnotism which was essentially composed of revitalized

mesmeric errors disguised in advanced neurological technology. He presented his neurological theory of hypnosis to the French Academy of Sciences in 1882 in his pseudoprecise nosological classification system (Pattie, 1956). Charcot's theory was a myopic insistence on a simplistic, prepsychological explanation during a time when practicing clinicians like Bernheim and Liebeault had advanced to a more sophisticated level of scientific understanding. The work of Bernheim and Liebeault ushered in the Early Psychological Period (Fromm & Shor, 1979).

Early Psychological Period. With the sophistication of the third stage came the integration of two previously, but separately, acknowledged insights: 1) mesmeric-hypnotic phenomena are genuine, and 2) mesmeric-hypnotic phenomena are essentially psychological in nature. The admixture of these two basic insights finally resulted in a third very important insight that the psychological processes underlying hypnotism (i.e., imagination, expectation, belief, cooperation, anticipation, receptivity, enthusiasm, motivation, attention, attitude, and suggestion) are scientifically valid and important (Fromm & Shorr, 1979; Korger, 1977).

The abbot Jose Custodi di Faria was the first practitioner to give credence to the scientific validity of the psychological processes underlying hypnosis in 1814. He adamantly rejected mesmeric theories of external influences

and proposed instead that lucid sleep (somnambulism) occurred only with a subject's heightened expectations and receptivity. He was among the first psychological proponents to use verbal suggestion during the induction procedures, which he introduced in a soothing yet commanding style. He reinforced the hypothesis that hypnotic influences lay within the individual rather than external agents. After treating over 5000 persons with his form of hypnotic induction, he stated that cures were not due to magnetism, but rather to the expectancy and cooperation of the patients. This view rapidly gained support when in the 1920's Alexander Bertrand, originally an orthodox mesmerist, published his developments of Faria's psychological point of view.

In 1847, James Braid modified his original emphasis on physiological mechanisms and shifted to a more psychological view of hypnosis. Nonetheless, he maintained that definite physiological changes occur in hypnotized individuals (Bramwell, 1956; Kroger, 1977).

Liebeault, a poverty stricken country physician, allowed his patients to choose their method of treatment; either by drugs with a fee, or by hypnosis free of charge. His success with hypnotic treatment captured the interest of the renowned neurologist Berheim from Nancy. Although initially skeptical, Berheim quickly became convinced of the efficacy of hypnosis in curing the ill. Together, Berhiem

and Liebeault treated over 12,000 patients and introduced the concepts of suggestion and suggestibility (Kroger, 1977). Berheim's impeccable reputation further stimulated the growth of hypnosis.

The hypnotherapy of Liebeault and Berheim consisted of inducing a state of heightened suggestibility followed by verbal suggestions of general well being and direct symptom disintegration. Their simplistic approach ignored symptom etiology and underlying dynamics. Pierre Janet was among the first to conceptualize consciousness in terms of multiple systems or levels where serious attention was given to such dynamic factors (Pattie, 1956).

However, Sigmund Freud, while visiting Liebeault and Berheim's clinic in Nancy, made the essential observation that redirected and shaped his life's work on unconscious processes. During this same time a colleague of Freud's, Joseph Breuer, had developed a method for treating hysteria. Breuer proposed that the etiological factors responsible for hysteric symptomology were pent-up, painful memories, held deeply below consciousness. He demonstrated to Freud that while under hypnosis, he could use suggestion to gain access to these memories and elicit spontaneous venting in his patients. This intense emotional catharsis resulted in cures due to elimination of the repressed energies responsible for the hysteric symptoms. Freud collaborated with Breuer for some time in pursuing this line of theory,

research, and practice. However, Freud eventually but reluctantly abandoned hypnosis for several reasons. He could not successfully hypnotize every patient to a sufficient depth; second, the cures appeared temporary and subject to symptom substitution; third, posthypnotic suggestions could not be maintained; fourth, patients' resistances often prevented the elicitation of traumatic material; and finally, he believed hypnosis could strip patients of their protective defenses too soon in treatment (Fromm & Shor, 1979).

Fortunately Freud's abandonment of hypnosis did not discredit its validity as a psychological intervention, but rather demonstrated his inability to apply hypnosis consistently in his own hypnotherapeutic methods. Although Freud could not use hypnosis further in his psychodynamic work, some hypnotists have drawn upon his theory of the unconscious for explaining and understanding their methods.

Modern Psychological Period. Milton H. Erickson was probably the first, most ingenious, and influential of the fourth stage, modern hypnotists. At the invitation of Clark Hull while at the University of Wisconsin in 1923, Erickson offered the first graduate seminar on hypnosis while he was still an undergraduate, pre-medical student. This experience promoted Erickson's career in hypnosis, as well as the therapeutic application of hypnosis. Stated simply, Erickson's hypnotherapeutic, strategic approach emphasizes

brevity and limited goals without the need for insight. He would attempt to enter a patient's neurotic world empathically and, with his intuitive understanding of nonrational dynamics of the unconscious, attempt to redefine symptoms to make the neurosis more successfully adaptive (Fromm & Shor, 1979).

More generally, modern hypnotherapy requires the development of a cooperative relationship between the hypnotist and subject (Kroger, 1977). Through some means of induction, the subject creates an altered state of consciousness and heightened responsiveness in which repressed materials are sometimes more readily available than in a normal waking state. It should be noted, however, that this over-simplified description of Erickson's theory and application of hypnosis represents only one such theory. In the next section other prominent theories of hypnosis will be outlined.

Major Theories of Hypnosis

The concept and production of hypnosis has long been an enigma, subject to as many definitions and theories as there are theorists (Kroger, 1977). This can be compared to the difficulty of developing a theory of human behavior in that there are numerous theories of hypnosis with all hypnotic phenomena having their counterpart in human behavior. It is no wonder then that hypnosis is difficult to understand and define. Nonetheless, several theories of hypnosis have

been developed over the past half century based on anecdotal reports and empirical research. The following brief review covers some of the more prominent, recent theories of hypnosis.

The Neo-Dissociation Theory. Ernest Hilgard (1979) proposes that hypnosis occurs as a result of dissociation of ego control functions. Before such a hypnotic dissociative state can be brought about, an initial agreement of cooperation in the generation of the expected behaviors must be made between the hypnotist (operator) and the subject. Such an agreement is often referred to as the hypnotic contract. Essential for hypnotic induction and the dissociative experience according to Hilgard, in addition to the "hypnotic contract," is the disruption of memory. He hypothesizes that through weakening memory, critical abilities are temporarily reduced for reality judgments, and imagination easily becomes hallucinated reality.

Hilgard views the central executive functions or ego controls as "fractionated" between the operator and the hypnotized individual. Although hypnotized persons retain a large degree of their executive functions from the normal waking state, they relinquish some of this control to the operator. Hilgard believes this explains why a subject can answer questions about the past or plans for the future, and either accept or reject suggestions to engage in particular kinds of suggested experiences.

After a subject's executive functions have negotiated the hypnotic contract and fractionated the ego controls, the subject's monitoring functions reduce the amount of critical scanning, resulting in a lowered reality orientation. Consequently, reality may become distorted, more or less, according to the degree of hypnotic involvement. Hilgard postulates three major divisions in the fractionation of the monitoring functions: 1) the preserved normal observing function, 2) a portion of this normal observing function hidden beneath amnesic behavior, and 3) a distorted, uncritical function, which as a consequence of suggestion freely accepts distorted reality as though it were undistorted.

Stated succinctly, Hilgard's neo-dissociation theory of hypnosis suggests that there are degrees or variations of dissociative experiences brought about when a subject allows conscious, control, and monitoring functions to be divided between self and operator. This in turn results in parallel processing of information, selective attention, and selective inattention, at different levels of consciousness; thus hypnosis.

The Social-Psychological Role Theory. Among the most outstanding proponents of the social-psychological role theory of hypnosis are T. R. Sarbin and his associates (Sarbin & Andersen, 1967; Sarbin & Coe, 1972). Specifically, they regard hypnotic phenomena as role enactments

whereby the subject assumes the role of a hypnotized person. Such role taking occurs within the particular limitations imposed by individual expectations, ideas and knowledge of hypnotic behavior, skills, self-conceptions, and by the particular demands of the situation (Sarbin & Slagel, 1979). This underscores the importance Sarbin and others ascribe to social and interpersonal relationships, and rapport between the operator and the subject, as prerequisites to hypnosis.

The Ego-Psychological Theory. In some ways E. Fromm's (1979) ego-psychological theory of hypnosis is similar to Hilgard's neo-dissociative theory. Both may be viewed in terms of a self-excluding function of some aspects of the ego. Fromm elaborates on the ego-regressive activities during hypnosis, and describes various states induced during hypnosis in terms of ego-passivity or ego-activity (Kroger, 1977). She attributes the hypnotic experience to an individual's nonrational submission of executive control during the regressed, dissociated state. She further proposes that the operator shapes the individual's regressed state making it easier to achieve the desired goals.

State versus Non-State Theories. Terms such as "hypnotic trance state" have proliferated since the late 1800's, and have been used freely by scientists and laymen (Fromm & Shor, 1979). Although the meaning of these terms has evolved over the years, they have consistently referred to the occurrence of a fundamental alteration in the "state"

of the individual (Barber, 1979). Hence, such theories of hypnosis are referred to as "state theories." As pointed out earlier, an inherent problem in defining hypnosis is that its complexity lends itself to diverse definitions and theoretical explication. For example, Hilgard described hypnotic trance as a state analogous to sleepwalking, hence the term somnambulism as applied to a deeply hypnotized person; Bowers believes most present day researchers agree there is a hypnotic state fundamentally different from the waking state; Orne includes a tolerance for logical inconsistencies (trance logic) as an essential characteristic of the hypnotic state; and Fromm points out the presumed importance of ego involvement and regression. In summary, proponents of the trance state paradigm, though disagreeing on the precise mechanisms, agree that when persons respond to suggestions from an operator, they do so while in a qualitatively different "state" from persons unresponsive to such suggestions.

In contradistinction to the state paradigm, Barber (1979) sees no qualitative difference in the state of the person who is responsive and the person who is not responsive to hypnotic suggestions. His alternative paradigm, or non-state theory, assumes that responsiveness to suggestions is based upon a number of overlapping antecedent, intervening, and dependent variables, like attitudes, motivations, and expectancies toward the

communications they are receiving. Further, he proposes that each person's attitudes, motivations, and expectancies vary on a continuum from negative, to neutral, to positive, and interact in complex ways to determine to what extent a person will experience the suggestions. In sum, for Barber, induction of a special state is not necessary for the elicitation of hypnotic-like behaviors or subjective experiences in individuals, as long as there exist adequate positive attitudes, motivations, and expectancies.

Conversely, Pearson (1970) and Thompson (1970) find it difficult to believe that simulators or role-taking subjects could forego anesthesia for abdominal surgery. In agreement, Kroger (1977) details the large number of surgical and obstetrical operations he performed on hypnotized patients, as well as its successful application in many fields of medicine and dentistry. Nevertheless, the state-nonstate issue remains an unanswered question open to empirical research.

The brief overview above demonstrates that while each theory of hypnosis may hold some validity, none adequately or completely explains this complex phenomenon. Presently, there exists no comprehensive theory of hypnosis which fully describes the intricacies of this psychophysiological process (Kroger, 1977). Perhaps with continued research, important questions may be answered, thereby adding to and

refining existing theories of hypnosis into a more unified model.

The next section outlines two theories of memory most applicable to hypnotic questioning of individuals who witness serious crimes or accidents: 1) the memory-permanence theory, and 2) the memory-construction theory. These theories are based on extensive clinical and laboratory research, as well as anecdotal reports from police hypnoinvestigators.

Two Theories of Memory

Modern theories of memory generally agree on their treatment of memory as a three-stage process: 1) acquisition or encoding, 2) storage or retention, and 3) retrieval (Penrod, Loftus, & Winkler, 1982). However, the debatable question concerning memory and forgetting asks whether 1) forgetting occurs due to the deterioration or alteration of the stored information in long-term memory, or 2) whether it results from a loss of access to information, which once stored, remains forever (Loftus & Loftus, 1980). These two questions underlie the two competing theories prevalent in the literature; the memory-construction theory and the memory-permanence theory, respectively.

Memory-permanence theory. Many leading theorists believe that although loss from short-term memory does occur, the human brain registers an accurate and complete representation of reality, stored permanently in long-term

memory (Block, 1976; Cheek & LeCron, 1968; Penfield, 1969; Penfield & Perot, 1963; Penfield & Roberts, 1959; Reiser, 1978; Shiffrin & Atkinson, 1969; Tulving, 1974). They argue that once information is encoded, it is represented veridically, and remains unaffected by subsequent input. Therefore forgetting results from using improper or ineffective retrieval cues incapable of locating the information which remains "buried" somewhere within long-term memory. These researchers espouse a memory-permanence theory commonly referred to as the "video recorder model" or "exact-copy model" (Dellinger, 1978; Penfield, 1969; Putnam, 1979; Reiser, 1978; Zelig & Beidleman, 1981). In sum, proponents of this model believe that when people have trouble remembering, it is because the retrieval technique was simply not adequate in locating the information copied exactly as experienced (Loftus & Loftus, 1980).

Memory-construction theory. The major advocates of the memory-construction theory are E. F. Loftus and her associates (Hilgard & Loftus, 1979; Loftus, 1974, 1975, 1979; Loftus & Loftus, 1980; Loftus, Miller, & Burns, 1978; Loftus & Palmer, 1974; Loftus & Zanni, 1975). From a series of empirical investigations on memory for eyewitnessed events, these researchers concluded that memory is not necessarily permanent; we do not simply record every event in memory like a videotape recorder (Hilgard & Loftus, 1979). Instead, they posit that memory of eyewitnessed

events may be undermined at several steps along the way from information encoding to information retrieval. Further, Penrod et al. (1982) stated, "Perhaps less well known is the fact that even stored memories are subject to change and distortion over time" (p. 158). Although forgetting occurs with long retention intervals, new false, postevent information can systematically bias and alter previously stored information (Loftus 1975; Loftus & Palmer, 1974; Loftus & Zanni, 1975). Related to this, Loftus (1975) proposed a three-stage memory-construction model: 1) acquisition of original experience, 2) acquisition and integration of subsequent information, and 3) retrieval processes.

During the first stage, an individual must rapidly decide which features of the complex event will be attended to in arriving at action decisions and/or storage. Since the visual environment contains a vast amount of information, the proportion of information which is actually perceived is very small. Hence, according to Loftus (1975) we do not record an exact copy of every detail we sense and, in fact, do not sense every detail in the visual environment.

In the second stage, the acquisition of subsequent information, which may be introduced in the form of leading questions, may be integrated into the memory representation of the original event. In effect, what results is a constructive addition or alteration of the original information

stored in memory of details or aspects of the event that never occurred.

Finally, during the third stage of the model, the retrieval process, when the individual is questioned either objectively or by free narrative recall, he or she reconstructs an image based on the altered memory representation. Then all responses will be made in terms of the reconstructed image.

In sum, Loftus suggests that information acquired during a complex event (i.e., eyewitness to a crime or accident) is apparently integrated into an overall memory representation. Between the time the event is observed and the time it is recounted to someone else, a person can be exposed to new information about the witnessed event.

Leading Questions

Subsequent information about an event may be introduced inadvertently or intentionally during interrogation via questions containing true or false presuppositions. Loftus defines these types of questions as "leading" since they imply the existence or absence of some bit of information which was actually either present or nonexistent, respectively. Thus, a leading question is one that either by its form or content suggests to the witness what answer is desired, or leads the witness to the desired answer (Hilgard & Loftus, 1979). The significance of leading questions on memory for eyewitnessed events is demonstrated

in their ability to supply additional information to the witness. In other words, the danger of leading questions lies not just in their temporary effect on the answer provided, but the effects they have on long-term memory resulting in actual reconstruction of the witness's memory (Loftus, 1975, 1979). Therefore, when later questioned about the original eyewitnessed event, the witness forms a reconstructed image from the altered memory and bases his/her response on that image.

Recent investigations on the matter of question wording have shown that small, apparently inconsequential changes in wording can result in dramatically different answers. In two studies (Loftus & Palmer, 1974; Loftus & Zanni, 1975), subjects were shown films of complex events which they later were asked to remember and report on. The authors reasoned that this format would provide a permanent record of each event, and that specifically constructed questions would make it possible to determine the inaccuracies that particular wordings could produce.

Loftus and Zanni (1975) showed a short film segment depicting a multiple car accident to 100 students. In the film, a car makes a right hand turn into the main traffic flow. The turn causes on-coming cars to stop abruptly resulting in a five car collision. Following the film, subjects completed a 22-item questionnaire containing critical questions interspersed with filler questions.

Three of the critical questions concerned items that appeared in the film, while three others concerned items that had not actually been present. For half of the subjects, the critical questions began with "Did you see a . . .?", as in "Did you see a broken headlight?" The other half of the subjects received critical questions beginning with "Did you see the . . .?", as in, "Did you see the broken headlight?" Hence, the two critical question forms differed only in the substitution of the indefinite and definite articles, "a" and "the," respectively.

The results demonstrated that subjects who received "the" questions were much more likely to report having seen something that had not actually appeared in the film. In other words, "the" questions were more leading than "a" questions. Apparently, when investigators ask witnesses leading questions like, "Did you see the broken headlight?", what is essentially relayed to the witness is "There was a broken headlight; did you happen to see it?" This implicit assumption influenced the witnesses' reporting of nonexistent details. In contrast, the article "a" does not necessarily convey the implication of existence. Loftus and Zanni (1975) concluded that even this very subtle change in wording questions can lead and influence witness memories.

In another study, Loftus and Palmer (1974) showed subjects films of automobile accidents and then asked questions about the witnessed events. The purpose of this

study was to investigate the effects of wording changes on quantitative judgement. Forty-five subjects viewed the films and responded to a questionnaire. The critical question for some subjects was "About how fast were the cars going when they 'hit' each other?" Other subjects were asked the same question with the verb "hit" replaced with "smashed," "bumped," "collided," or "contacted." All these variants refer to the coming together of two automobiles, but they differ in what they imply about the speed and force of impact. The results showed that subjects questioned with the "smashed" question gave the highest speed estimates for the cars involved in the accident, while subjects questioned with "contacted" and "hit" gave the lowest speed estimates.

Together these two experiments point out that in a variety of situations, the wording of a question about a witnessed event can influence or lead the answers given. This effect has been observed when a person reports personal experiences, events recently witnessed, and when responding to a general question not based on any specific incident (i.e., "How short was the movie?" versus "How long was the movie?")

Finally, in an unpublished study (cited in Loftus, 1975), 40 subjects were interviewed about their headache history and headache products. The subjects believed they were participating in market research on these products. Two questions were critical to the experiment. One asked

about products other than those currently being used, in one of two wordings: (1a) "In terms of the total number of products, how many other products have you tried? 1? 2? 3?", (1b) "In terms of the total number of products, how many other products have you tried? 1? 5? 10?" (Loftus, 1975, p. 561). A statistically significant difference was found between 1/2/3 subjects who claimed to have tried an average of 2.3 other products, whereas the 1/5/10 subjects claimed an average of 5.2.

The second critical question asked about headache frequency in two alternate ways: (2a) "Do you get headaches frequently, and, if so, how often?", (2b) "Do you get headaches occasionally, and, if so, how often?" (Loftus, 1975, p. 561). The "frequently" subjects reported an average of 2.2 headaches per week, whereas the "occasionally" subjects reported only 0.7 per week. In this case, too, the differences were significant.

In a series of experiments, Loftus (1975) investigated the effect of the wording of a question, not on its answer, but instead, on the answers to other questions asked some time afterwards. In each experiment, the key initial questions contained presuppositions, or embedded misinformation, which implied the presence of non-existent details. The results of these experiments, combined with previous findings, eventually resulted in Loftus' (1975) reconstructive theory of memory.

In experiment one of this series, 150 subjects viewed a one-minute film of a multiple car accident in which one car, after failing to stop at a stop sign, makes a right hand turn into the main stream of traffic. During the last four seconds of the film clip, the oncoming traffic suddenly stops, resulting in a five-car pile-up. Following the film, the subjects completed a 10-item questionnaire containing one critical item asked in two different ways: (1) "How fast was the car going when it ran the stop sign?", and (2) "How fast was the car going when it turned right?" Half of the subjects received the "stop sign" question and the other half the "turned right" question. The tenth and final question identical for all subjects asked, "Did you see a stop sign?" Subjects answered by circling yes or no on their questionnaires.

The results showed a significant difference where 53 per cent of the subjects in the stop sign group responded "yes" to "Did you see a stop sign?", compared to only 35 per cent in the turn right group. Loftus (1975) concluded that the wording of a presupposition in a question about some event, when asked immediately after the event has occurred, can influence the answer to a subsequent non-leading question about the presupposition in the direction conforming to the supplied embedded misinformation.

In another experiment (experiment 3) 150 subjects watched a brief videotape of an automobile accident and then

answered ten questions about the event. The critical question concerned the speed of a white sports car involved in an accident. One-half of the subjects were asked a false presupposition question, "How fast was the white sports car going when it passed the barn while traveling along the country road?", while the other subjects were asked, "How fast was the white sports car going while traveling along the country road?" In fact, there was no barn shown in the film. All subjects gave their estimates of speed and were asked to return one week later. Upon returning and without reviewing the videotape, all subjects answered another ten questions about the accident. The final question asked, "Did you see a barn?", a non-leading question using the indefinite article "a." This final question was used to assess the impact of the embedded misinformation. A significant difference was found between the subjects who were earlier asked the question containing the embedded misinformation of a "barn" compared with the subjects who were asked the nonleading question without the embedded misinformation. Here, 17.3 per cent responded "yes" to having seen the nonexistent barn in contrast to only 2.7 per cent in the second group, respectively. Thus, an initial question containing embedded misinformation was shown to influence witnesses' later reports of having seen a nonexistent object corresponding to the embedded misinformation (Loftus, 1975). Loftus concluded that only

a reconstructive memory theory could adequately explain these results.

In the previously discussed experiments (Loftus, 1975; Loftus & Palmer, 1974; Loftus & Zanni, 1975), the original event was presented visually, the subsequent information was introduced verbally in questionnaires, and the final test was verbal in nature. In their more recent study, Loftus et al. (1978) undertook four experiments to investigate further the action of semantic integration of verbal information into visual memory. A methodological change introduced a recognition procedure. This procedure involved a series of slides depicting a complex event followed by providing subjects verbal information about the event. Finally, the subjects were shown target pictures identical to the ones seen before plus "distractor" pictures altered in some way. Loftus et al. (1978) offered two rationales for this procedural change over previous work: 1) if one ascribes to the view that verbal and visual information are stored separately, one could easily argue that Loftus' (1975) final test, verbal in nature, helped subjects access the subsequent verbal information, thereby resulting in an inaccurate answer; and 2) if recognition is a presumed passive process of matching stimuli to precise locations in a content-addressable storage system, one could argue that a representation of the actual scene would result in a match, whereas an alteration would fail to match.

In the pilot experiment, 129 subjects were shown a series of 30 slides, depicting successive stages in an auto pedestrian accident. The automobile, a red Datsun, was shown traveling along a side street toward an intersection having a stop sign for half the subjects, and a yield sign for the other half. These two critical slides were identical in content except for the different signs. The remaining slides showed the car turning right and knocking down a pedestrian in the crosswalk. Immediately following the slide presentation all subjects answered a 20-item questionnaire. For half the subjects, Question 17 was, "Did another car pass the red Datsun while it stopped at the stop sign?" The remaining subjects answered the same question with yield sign substituted for stop sign. All subjects participated in a 20-minute filler activity between completion of the questionnaire and the final yes-no recognition test administered either immediately or one week later. The two critical slides (stop, yield) were randomly placed in the recognition series in different positions for the various groups of subjects.

The results showed that relative to the case in which consistent information was received, embedded misinformation resulted in significantly fewer "hits" (correct recognition of slide actually seen) and slightly more "false alarms" (false recognition of a slide not actually seen). They found that with embedded misinformation, the percentage of

hits was 71 and the percentage of false alarms was 70. This indicated that these subjects had no ability in discriminating the sign they really saw from the sign they did not see.

In the first experiment, following the pilot investigation, subjects were presented with the same 30 acquisition slides, an intervening questionnaire, and a final forced-choice recognition test (Loftus et al., 1978). They found embedded misinformation resulted in significantly less accurate answers than consistent information. Next, to diminish the possible effects of demand characteristics--clues that permit observant subjects to discern and attempt to confirm the experimental hypothesis (Orne, 1962)--experiment two showed that when subjects were told they might have been exposed to misleading information and asked to state whether they believed they had, most maintained they had seen the nonexistent object.

Experiment three looked at whether misinformation presented verbally would have a different effect depending on the time interval between acquisition and retrieval. The subjects in this phase of the study received their final recognition test after a retention interval of zero minutes, 20 minutes, one day, two days, or one week. The subsequent misinformation was introduced either immediately after the slides (at the beginning of the retention interval) or just before the final test (at the end of the retention

interval). It was found that embedded misinformation had a greater impact if presented just before the recognition test as opposed to just after the initial event. In other words, the weaker the original trace, the easier it is to alter (Loftus et al., 1978).

Finally, Loftus (1979) set out to investigate the effects of blatantly contradictory information following the witnessing of a complex event. She wondered if there is a limit to the kinds of subsequent information that can alter a witness's memory and appear in the witness's report. Stated differently, for a nonexistent object to be incorporated into a person's memory, must that object be plausible in light of the witnessed event? In the first of two experiments, 46 subjects participated in four phases: viewing a series of slides, completing an accuracy questionnaire, reading a narrative, and taking a final test. A sequence of 24 color slides showed a wallet snatching incident in a small town. After viewing the slides and engaging in a short filler activity, the subjects completed a 30-item questionnaire which addressed diverse details of the wallet snatching scene with declarative, multiple-choice sentences. At the beginning of the second session, all subjects read a one page narrative containing a version of the incident which was supposedly prepared by a psychology professor who had seen the slides for 30 seconds each, in contrast to five seconds each for the subjects. No mention

was made of the professor's credibility or the factualness of his description. Embedded within the full page narrative were erroneous descriptions of four critical items that were relatively peripheral to the central characters and action, yet plausible. In one version, the narrative also mentioned a nonexistent object--blatantly false information.

Half of the subjects, designated as the blatant group, read the narrative with the four erroneous items and the blatant item. The other half, the subtle group, read the narrative which contained only the four erroneous items.

The final test consisted of 20 declarative sentences with three choices for a missing word or phrase. Subjects were urged to answer only on the basis of their own recollection instead of the professor's account.

The major result from this experiment showed that subjects uniformly rejected the blatant piece of misinformation. Further, these subjects were more resistant to the four subtle bits of misleading information than those who were not exposed to the blatant misinformation. The blatant group's final test responses to the critical items were much more accurate than the subtle group's.

In the second experiment, Loftus replicated the previous method but temporally varied the presentation of the blatant information. One group received this patently false information during the beginning of the narrative, as before; a second group read of the blatant misinformation

approximately one hour later; and a third group received no blatant misinformation. As in the first experiment, the blatant group was resistant to suggestions of any kind. Therefore it is possible that the presence of blatantly false information causes a person to scrutinize it more closely than usual. However, when the blatant misinformation was delayed for one hour, the subjects in group two were no more likely to resist the more subtle suggestions than subjects in group three, who had not received blatant misinformation at all. Loftus (1979) concluded that new information becomes integrated into memory at the time it is first introduced and comprehended.

Overall, Loftus (1979) reasoned that new and erroneous misinformation presented in a leading fashion can cause irreversible restructuring of memory. Hence, any manipulation that changes the contents of memory unbeknown to people will make them unable to distinguish between experiences and imaginations.

Hypnotic Aids for Memory of Eyewitnessed Events

Memory-permanence theory and hypnosis. The memory-permanence theory has enjoyed support among such diverse groups as researchers, theorists, psychologists, law enforcement officers, hypnoinvestigators, and the lay public (Dellinger, 1978; Loftus & Loftus, 1980; Putnam, 1979; Reiser, 1978). The wide acceptance of this theory can be seen in numerous anecdotal reports involving the use of

hypnosis in criminal and accident investigations as the most effective retrieval tool. For example, two hypnotherapists, Cheek and LeCron (1968), wrote in Clinical Hypnotherapy,

It seems that everything that happens to us is stored in memory in complete detail. Conscious recall is limited to a very tiny part of total memory.

Regression under hypnosis can bring out completely forgotten memories. It is also possible to bring them out merely by suggesting that they will be recalled.

In this situation the patient remembers but doesn't relive the event (p. 54).

Similarly, criminal investigators have made claims like those in the following quotation by a detective trained in the use of hypnoinvestigation:

It is all there even if you are not aware of it.

Everything that has ever happened to you, from birth to death, is recorded on your brain permanently. If that defense mechanism can be relaxed enough, it will enable the subject under hypnosis to describe what is written on the brain (White, 1977, p. 1).

Acceptance and propagation of the power of hypnosis has reached a vast audience and lay public through the popular press as in the TV Guide article which stated:

Frequently when someone is shot, raped, beaten or otherwise attacked, he or she performs a defensive maneuver. They throw-up a guard against fright,

anxiety, and other traumas. Acting on survival instinct, they hide the hurt. Through hypnosis we make the conscious mind passive and communicate with the subconscious to release what's buried there (Stump, 1975, p. 34).

Reiser (Dellinger, 1978) also believes that trauma or anxiety is the key to hypnosis investigation because witnesses and victims are so emotionally affected by the witnessed event that many repress information they have mentally recorded. In the same vein, Schafer and Rubio (1978) base their hypnoinvestigative work on the premise that witnesses' accounts of crimes and accidents are clouded by anxiety. Stratton (1977) noted that recall may be impoverished due to narrowing of the perceptual and cognitive fields when an individual witnesses a traumatic event. He stated,

In a traumatic situation the individual focuses on the most important aspects of the situation, and the peripheral incidents, although seen and recorded by the mind, are often not recalled. Through relaxation under hypnosis and focusing on other aspects of the criminal act, there appears to be a recall of these peripheral and often important events (Stratton, 1977, p. 400).

In short, the major claim arising from such reports is that witnesses of serious crimes and accidents can be helped to access their memory and retrieve an exact copy of the

videotape recording if questioned under hypnosis. However, the bulk of the support for this claim consists of anecdotal reports rather than empirical research (Block, 1976; Dellinger, 1978; Kroger & Douce, 1979; Schafer & Rubio, 1978; Stratton, 1977; Stump, 1975; Reiser, 1978).

Memory-construction theory and hypnosis. As pointed out in the previous section, proponents of the memory-permanence or exact-copy theory of memory posit that hypnoinvestigators need not be concerned about the possible effects of suggesting answers to the witness. On the contrary, they believe these suggestions serve as retrieval cues helping a witness more accurately access the needed information, which if stored, is veridically represented in long-term memory (Putnam, 1979). If the witness appears confident of the answer provided, the investigator will most likely assume that the recollection is accurate.

Conversely, the reconstructive memory theory implies that suggestions by the investigator may become incorporated into a witness's memory, transforming the original memory of the witnessed event to fit the new piece of information. Moreover, this process may occur in such a way that neither the witness nor the investigator is aware of the leading nature of the questions or the error created in the witness's memory.

Orne (1979) made several significant points in his review of the use and misuse of hypnosis in court. Orne

noted first that hypnosis cannot assure the veracity of the information. He pointed out that even subjects in deep hypnosis can willfully fabricate a very convincing story. This problem is further complicated by the fact that hypnosis in investigative settings may cause subjects to intentionally create such a fabrication more than is the case in laboratory settings due to what he refers to as demand characteristics--telling the investigators what they want to hear. Not only are these fabrications difficult for experienced hypnotists/investigators to detect, but they may be accepted by the eyewitness as true, and upon awakening be indistinguishable from actually perceived events. A similar occurrence may result with a more honest witness when interrogated with leading questions. Without proper safeguards hypnotic procedures may create a convincing, apparently honest witness who would unknowingly testify later about fabricated memories. While Orne agrees that hypnosis may help refresh memories, he believes that it should not be used if the witness, police investigator, hypnotist, or artist have any preconceptions about any details under question.

To further compound the problems of leading questions and hypnotic investigations in altering witnesses' memories, Putnam (1979) suggested that witnesses questioned under hypnosis are even more susceptible to leading questions when compared to subjects in a normal waking state. In Putnam's

study (1979), 16 subjects drawn from a previous screening for hypnotic susceptibility were randomly assigned to one of four groups in a 2 x 2 design. Subjects viewed a videotape of a car-bicycle accident. After either a short (15-minute) or long (one day) delay, subjects received a questionnaire that asked some objective questions and some questions containing misleading information. Half of the subjects were questioned under hypnosis while the others were not. Although Putnam found no effect for temporal delay, hypnotized subjects made more errors on the leading questions than non-hypnotized subjects. He interpreted these results as indicating that hypnosis does not allow subjects to retrieve a veridical memory. Quite the contrary, subjects appeared more suggestible in the hypnotic state and consequently were more easily influenced by the leading questions than non-hypnotized subjects. In addition, even though the hypnotic subjects made more errors, they were just as confident as non-hypnotized subjects who made fewer errors. As Orne (1979) suggested, Putnam found that subjects under hypnosis answered more leading questions incorrectly without awareness of their inaccuracy.

It should be noted that five of the six leading questions in Putnam's study consisted of simply using the definite article "the" instead of the indefinite article "a," with substantial effects. For example, when hypotized

subjects were asked if they saw "the" license plate when it was not at all visible, not only were positive responses elicited, but some offered partial descriptions of the plate number without duress.

These results support a reconstructive theory of memory (Putnam, 1979). An exact-copy theory cannot easily account for the increase in errors made by subjects when answering the leading questions.

On the non-leading questions, no differences were found between hypnotized and non-hypnotized subjects. This seems particularly puzzling in light of the reports of increased recall from police investigators (Reiser, 1976, 1978; Schafer & Rubio, 1978). However, as discussed earlier, proponents of the memory-permanence theory, such as police hypnoinvestigators, state that the main reason they obtain positive results from hypnotic questioning, where laboratory researchers have not, is due to intense emotional arousal experienced by a witness during an actual crime or serious accident (Cheek & LeCron, 1968; Schafer & Rubio, 1978); Stratton, 1977; Stump, 1975; Reiser, 1974, 1976, 1978).

The most obvious flaw in Putnam's design is the small number of subjects; he had only four per cell, for a total of 16 subjects. Additionally, he made no mention of whether he equalized the four cells for sex (Powers et al., 1979) and susceptibility to hypnotic induction (Zelig & Beidleman, 1981). Therefore, there is no way to assess whether these

variables accounted for his results. Finally, although his data suggest that hypnosis may not aid recall when there is little emotional involvement on the part of the witnesses, his design and method did not look into the possible effects of anxiety which some of his subjects may have experienced while viewing the car-bike accident.

Eyewitness Anxiety. Anecdotal reports on the effects of anxiety (Baddeley, 1972; Kuehn, 1974) suggest that completeness of crime victims' descriptions of their assailants vary as a function of the degree of violence in the crime and the extent to which the victim was injured. Several eyewitness studies have attempted to manipulate event anxiety to determine its impact on eyewitness performance (Penrod et al., 1982). Johnson and Scott (1976) exposed subjects to either a low- or high-aroused condition. Males' recall and recognition were more accurate under high arousal, while females' memory for setting and actions was superior under high arousal but their recognition was poorer. Overall, the subjects' performance on picking the target person out of 50 photos was poorer under high arousal (33 per cent correct) than low arousal conditions (49 per cent correct). Generally, however, these results are inconclusive with respect to arousal (Penrod et al., 1982).

Clifford and Scott (1978) showed one of two versions of a one-minute filmed scenario to subjects. The films depict two policemen questioning a third person about a criminal

they are seeking. In the mild version the third person is mildly restrained while in the more violent (arousing) version one of the policemen assaults the third person. They found that recall for the violent film was significantly poorer. Further, recall of the actions was particularly reduced in the violent film version.

Sanders and Warnick (1979) used a similar method in presenting subjects with either non-violent or violent 20-second films of an interaction between a man and a woman. In the violent film, a man snatches a woman's purse and runs away, whereas in the non-violent film, a woman drops her purse and a man picks it up and hands it back to her. They found only a marginally significant difference between low arousal recognition accuracy (57 per cent correct identifications from a six person line up) and high arousal accuracy (37 per cent).

In summary, these researchers suggest that eyewitness memory is adversely affected by highly arousing, witnessed events (Penrod et al., 1982). However, none of these studies investigated the effects of hypnotic questioning and emotional arousal on eyewitness performance.

Zelig and Beidleman's (1981) study represents one of the most recent investigations of the effects of hypnosis for enhancing the recall of subjects exposed to an anxiety provoking stimulus under leading and non-leading questioning. Of an initial group of 90 subjects screened

with the Harvard Group Scale of Hypnotic Susceptibility, Form A (HGSHS:A; Shor & Orne, 1962) for hypnotic susceptibility, 36 met the medium-high to high cut score of seven or higher. These subjects were randomly assigned to either a hypnosis or non-hypnosis condition with two constraints: 1) equivalent numbers of males and females, and 2) equivalent hypnotic susceptibility scores among the groups.

All subjects were shown an eight-minute excerpt from the industrial safety film, "It Didn't Have to Happen." Using this 1956 black-and-white film, subjects were exposed to two staged shop accidents interspersed with didactic material on shop safety: 1) an amputated finger, and 2) an ejected board from a circular saw impaling and killing another worker. Previous research had demonstrated that the film evoked anxiety somewhat similar to witnessing an actual crime or serious accident. Following the film all subjects responded to a 20-item questionnaire containing 15 non-leading and five leading questions while either hypnotized or not hypnotized. All non-leading questions used a multiple-choice format while the leading questions used a forced-choice, yes-or-no format. The major reason the yes-or-no forced-choice format was used for the leading questions was to assess the veridicality of the subjects' memories.

The dependent variables included the number correct, the number of errors, and the mean confidence ratings

associated with the responses. Zelig and Beidleman analyzed these data separately for both leading and non-leading questions. These authors found that non-hypnotized subjects were more accurate than subjects in the hypnosis group on leading questions. However, this effect was not obtained for non-leading questions. Zelig and Beidleman (1981) concluded that their findings were not only a replication of Putnam's (1979) results, but an extension since their stimulus material had been empirically demonstrated to elicit anxiety in subjects.

The main problem in Zelig and Beidleman's (1981) study was that there was no way to determine the possible interaction effects of anxiety levels with state (hypnotized versus non-hypnotized). Their design used a simple two-group arrangement using the same videotape and questionnaire for both groups. In addition the videotape showed two accidents over an eight-minute time period, using an outdated, black-and-white film. Possible problems associated with this include an exposure length far above what might be normally experienced in real accident situations, coupled with a black-and-white film of characters with clothing, speech, and mannerisms which subjects could have had difficulty identifying. Finally, there were no pre- or post-anxiety measures obtained from subjects, surrounding the anxiety provoking stimulus material.

Purpose

The purpose of the present investigation was to test the effects of hypnotic versus non-hypnotic states and anxiety levels (high versus low) on the accuracy of subjects' memories for eyewitnessed events, when questioned with leading, non-leading, and embedded misinformation questions. The research design encompassed all the previously covered areas including hypnosis procedures, anxiety levels, memory for eyewitnessed events, and leading questions versus non-leading questions versus embedded misinformation questions.

It was hypothesized that 1) Hypnosis procedure subjects would be less accurate than non-hypnosis subjects on leading questions, 2) No differences would be found between hypnosis and non-hypnosis procedure subjects' accuracy for non-leading questions, 3) Hypnosis procedure subjects would be less accurate than non-hypnosis procedure subjects on embedded misinformation questions, 4) The groups who watched the high-anxiety film would score lower than those who watched the low-anxiety film on all three question formats, and 5) Hypnosis procedure subjects would be more confident than non-hypnosis procedure subjects on all three question forms.

Method

Subjects

Forty undergraduate students (20 males and 20 females) solicited through advertisements in the North Texas State University (NTSU) school newspaper and announcements in NTSU undergraduate psychology classes served as subjects for the present study. Students from various psychology courses received extra credit toward their final grade for their participation. In addition, all subjects were given an opportunity to attend two additional sessions to learn self-hypnosis skills for relaxation and improved self-confidence.

In the initial screening procedure, all potential subjects who responded to the advertisements were administered the Minnesota Multiphasic Personality Inventory, Form 168 (MMPI-168; Overall, Higgins, & de Schweintz, 1974). Those scoring within 2.0 standard deviations from the mean of 50 were considered eligible for hypnotic induction and inclusion in this study. Also, a second eligibility constraint involved the administration of the Harvard Group Scale of Hypnotic Susceptibility, Form A (HGSHS:A; Shor & Orne, 1962). Only subjects obtaining a susceptibility score within the moderately-high to high range (8-12) were invited to participate in the subsequent "experiment dealing with hypnosis." Thus, subjects meeting these two criteria were randomly assigned to one of the four experimental conditions, totaling five males and five females in each cell.

Materials

Videotape excerpts. Two videotape excerpts from the industrial safety film, "Shake Hands with Danger" were used (Clifford & Harvey, 1979), one which had been shown to elicit high emotional arousal or state anxiety, and the second low state anxiety, in a pilot investigation (Appendix A). These two color videotape excerpts were equivalent in length (high-anxiety excerpt = 65 seconds; low-anxiety excerpt = 65 seconds minus the 5-second ending of the graphic accident) and identical in content with the exception of the final graphic depiction of a serious accident in the high anxiety version. The short duration of these videotape clips approximate the length of time involved in actual eyewitness exposure to serious accidents or crimes. Both excerpts exposed subjects to events and didactic material surrounding the replacement of a "bucket" on a large land-moving Caterpillar tractor. First, two men are shown standing by the large bucket and linkage to the hydraulic lift of the tractor. One of the men appears uncertain of how to properly perform the job. The second man, apparently more experienced in such procedures, begins to take over, demonstrating the sequence of steps necessary in completing the task. The last maneuver before inserting the pin, which locks the bucket into the hydraulic lift-arm linkage, is the application of lubricant inside the coupling. Instead of using the proper tool, he carelessly

packs the inside of the coupling with grease using his bare hand and wrist. Meanwhile, the operator inside the tractor cab is distracted and stung by a wasp.

Up to this point, the film segments are identical. But in the high-anxiety arousing excerpt, the cab operator, in an attempt to swat the wasp, accidentally hits the hydraulic lift control causing the metal linkage of the lift arm, inside the coupling and enveloping the man's wrist, to raise, thereby amputating the man's hand from his wrist. Conversely, the low-anxiety arousing excerpt stops at the point in the film where the cab operator is stung by the wasp.

The Minnesota Multiphasic Personality Inventory, Form 168. The MMPI-168 is an abbreviated version of the standard 566-item MMPI (Hathaway & McKinley, 1951), containing only the first 168-items. Its diagnostic utility has been demonstrated in clinical and research applications (Overall et al., 1974). Overall and Gomez-Mont (1974) concluded that since scores from the MMPI-168 correlate highly with the clinical scale scores on the standard 566-item MMPI, that much of the variance of the standard MMPI clinical scales is concentrated in the first 168-items (common to both MMPI versions). In fact, in an effort to investigate the discriminative validity of the MMPI-168, Overall, Butcher, and Hunter (1975) provide data suggesting that the abbreviated form produces slightly better discrimination

than the longer 566-item form. Consequently, Overall et al. (1975) proposed that the MMPI-168 can serve as a basic psychiatric screening tool, just as valid, and much shorter than the standard parent instrument. Therefore, the use of the MMPI-168 as a screening measure for subjects who might have been inappropriate for inclusion in this study is supported by the research literature.

The Harvard Group Scale of Hypnotic Susceptibility: Form A (HGSHS:A; Shor & Orne, 1962). The HGSHS:A is an adaptation of the Stanford Hypnotic Susceptibility Scale, Form A (SHSS:A; Weitzehoffer & Hilgard, 1959) designed for group administration. By using retrospective self-report scoring, subjects indicate their performance on hypnotically suggested behaviors. Possible scores range from zero to 12, where zero indicates very low hypnotic susceptibility and 12 very high susceptibility.

Bentler and Hilgard (1963) found a correlation of .74 between the HGSHS:A group scale and the SHSS:A individual scale. Further, they reported that the self-scoring group method of the HGSHS:A correlates highly both for group induction (.83) and individual induction (.89) when compared with the scores of independent observers.

More recently, Laurence and Perry's (1982) work supported the earlier findings of Shor and Orne (1962) establishing the HGSHS:A as an efficient and economical instrument for evaluating hypnotic susceptibility of

subjects in group settings. Normative data obtained from a series of their investigations with the HGSHS:A reliably produced consistent results.

In sum, the HGSHS:A has been demonstrated through a series of studies to be a reliable and valid instrument for normative evaluation of hypnotic susceptibility. Therefore, the literature substantiates the application of the HGSHS:A as an index of hypnotic susceptibility and for screening individuals for further hypnotic procedures.

The Eight State Questionnaire: Forms A and B (8SQ:A; 8SQ:B; Cattell, 1976). The 8SQ was designed for measuring eight important emotional mood states. Both forms of the 8SQ contain 96-items: 12 items per scale which measure each state. It may be used with adults and adolescents 16 years of age and older, administered either individually or in groups.

Only the anxiety scale from the 8SQ: Forms A and B was used. The sole use of the anxiety scale should not affect the validity or reliability of the 8SQ because reliability and validity coefficients were determined separately for each individual scale (D. Madsen, personal communication, April 1983).

On an immediate retest Barton, Cattell, and Curran (1973) found reliability coefficients of .91 (Form A), .90 (Form B), and .94 (Forms A and B) for the anxiety scales. Correlations between the corresponding scales in Form A and

Form B revealed equivalence coefficients of .83 for the anxiety scales.

In terms of state scales, validity has its most precise meaning as concept validity (Barton et al., 1973). This refers to the correlation of the scale's score with the pure factor constituting the concept (i.e., anxiety) which the scale was intended to measure. Concept validities of .62 (Form A) and .58 (Form B) on the anxiety scales have been obtained. Therefore, the anxiety scales on Forms A and B of the 8SQ possess very good reliability and validity, supporting their use as indices of state anxiety. In addition, the use of these two equivalent forms allowed for repeated measurement of anxiety at brief intervals.

The Questionnaire. A 20-item questionnaire consisting of non-leading questions, leading questions, and questions with embedded misinformation implying the presence of nonexistent details in the film segments was used (Appendix B). These questions parallel those used in previous experiments on the effects of leading, non-leading, and embedded misinformation questions on memory for eyewitnessed events (Loftus, 1974, 1975, 1979; Loftus et al., 1978; Loftus & Palmer, 1974; Loftus & Zanni, 1975; Putnam, 1979; Zelig & Beidleman, 1981).

In developing the questions, 16 subjects in a pilot experiment rated the two films for anxiety and completed an item-checklist indicating only those items they remembered

having seen (Appendix A). The item-checklist contained 31 existent and 17 nonexistent details for the videotape segment which did not include the graphic accident. Items checked by at least 25 per cent of all subjects in the pilot experiment with a confidence rating of two or more were selected for inclusion in the 20-item questionnaire. This allowed for the production of a variety of questions which were considered by most subjects as "plausible" considering the videotape content (Loftus, 1979).

Procedure

All subjects who participated in this study completed the preliminary screening assessments regardless of final placement in a treatment condition. Therefore, each individual completed the MMPI-168 and the HGSHS:A.

As each subject arrived, he or she was asked to sign an informed consent statement which revealed that he or she might be exposed to emotionally arousing stimuli and might also be subsequently taken through a hypnosis procedure (Appendix C). Those wishing to continue were randomly assigned to one of the four groups: hypnosis procedure--high anxiety film; hypnosis procedure--low anxiety film; non-hypnosis procedure--high anxiety film; and non-hypnosis procedure--low anxiety film. Subjects were also randomly assigned to four experimenters who were blind to the research hypotheses.

Two additional constraints were incorporated into the assignment of subjects to a treatment condition. First, since the industrial safety film, from which the videotape segments were drawn, may contain predominantly masculine interests and cognitive categories, possibly favoring males in recall (Powers et al., 1979; Zelig & Beidleman, 1981), equal numbers of males and females were distributed to each group condition. Second, subjects were assigned so that the four cells were approximately equivalent on susceptibility as measured by the HGSHS:A screening (Putnam, 1979; Zelig & Beidleman, 1981).

Following completion of the informed consent statement and the anxiety scale of the 8SQ:A, all hypnosis procedure subjects were informed that they would see a videotape (either the low- or high-anxiety film depending upon group assignment) and were asked to watch it as if they were taking a tour of a large machine shop (Putnam, 1979). Immediately following the conclusion of the film, subjects completed the anxiety scale of the 8SQ:B. Subjects in the hypnosis procedure groups were then informed that they would be hypnotized in an attempt to improve their memory of what they had seen. Following the induction procedure taken from the Kroger and Fezler's (1976) direct induction, hypnosis procedure subjects were told to imagine themselves reclining comfortably in their living room, viewing a large television screen showing a videotape replay of what they had just

seen. They were then instructed to listen to the questions and answer them by watching the video replay in their minds to determine the correct answer. Further, these subjects were informed that they would be able to speed up, slow down, and freeze the action in order to form a clear image of the specific scene relevant to each particular question. Once a clear image had formed, they were told they would be able to zoom in and pick out the information needed to answer the questions. This imagery technique commonly used in police investigations involving hypnosis (Reiser, 1974, 1976, 1978) and in empirical research (Putnam, 1979; Zelig & Beidleman, 1981) is referred to as the t.v. technique. Facing away from the experimenter-hypnotist, the hypnosis procedure subjects heard the 20 questions read by the experimenter who was blind to the correct answers. This helped circumvent the possibility of cueing the subjects and biasing the results. Subjects were also asked to give a confidence rating of their answers using a scale of one to five, where one represented a guess and five complete certainty, with the other numbers accordingly in-between (Putnam, 1979; Zelig & Beidleman, 1981). After answering all the questions, hypnosis procedure subjects were given a posthypnotic suggestion to facilitate subsequent trance induction. Finally they were returned to a normal waking state, debriefed and thanked for their participation, and

scheduled for the additional sessions for instruction on the use of self-hypnosis for relaxation and self-confidence.

After presentation of the videotapes (either the low- or high-anxiety film depending upon group assignment), the non-hypnosis procedure subjects were seated comfortably while the experimenter read them a brief article on hypnosis (Goleman, 1977). Piedmont (1981) found this to be an effective control for the experimenter's presence and attention without the contribution of the confounding influence of suggestion. In addition, this controlled for the amount of time required for the hypnotic induction procedure with the subjects in the hypnosis procedure groups, and also controlled for confounding rehearsal effects which may have been present in Zelig and Beidleman's (1981) study (M. Zelig, personal communication, April 1983).

After listening to the article on hypnosis, non-hypnosis procedure subjects were told that they would be asked to recall information about what they had previously seen and that it was very important for them to answer as accurately as possible. Similarly, these subjects facing away from the experimenter, heard the same 20 questions read by the "blind" experimenter and gave their corresponding confidence ratings. They were told they would not be hypnotized only after the completion of the questionnaire. These non-hypnosis procedure subjects were then debriefed,

thanked, and scheduled for the additional hypnosis sessions to facilitate relaxation and self-confidence.

Results

All data analyses were performed using BMDP statistical software packages (Dixon et al., 1981). The analyses included three-way analysis of variance and two-way analysis of covariance. Neuman-Keul's post-hoc tests were used to test for the significance of differences between and among the cells.

Accuracy of Recall

The first three hypotheses about the question formats were tested by a 2 x 2 x 3 design. Film type (low- versus high-anxiety) x treatment (hypnotic versus non-hypnotic procedure) x question format (leading, nonleading, & embedded misinformation) was analyzed by a 2 x 2 x 3 analysis of variance, with question format serving as the repeated measure. From inspection of the means of correct responses to the three question formats, the groups differed only on embedded misinformation questions. Overall, leading questions were answered at the highest level of accuracy for all groups, followed by nonleading, and finally embedded misinformation questions (refer to Table 1, Appendix D). As shown in Table 2 (Appendix D), main effects for hypnosis and question format, as well as their interaction (hypnosis x question format) reached statistical significance, $F(2,72) = 5.98$, $p < .005$. A Neuman-Keul's post-hoc analysis

indicated that hypnosis procedure groups scored significantly lower on embedded misinformation questions than did non-hypnosis procedure groups, $p < .01$ supporting the third hypothesis (refer to Table 3, Appendix D). In contrast, nonsignificant differences were found between hypnosis and non-hypnosis procedure groups on the other two question formats. The interaction results are graphically depicted in Figure 1. These results support the second

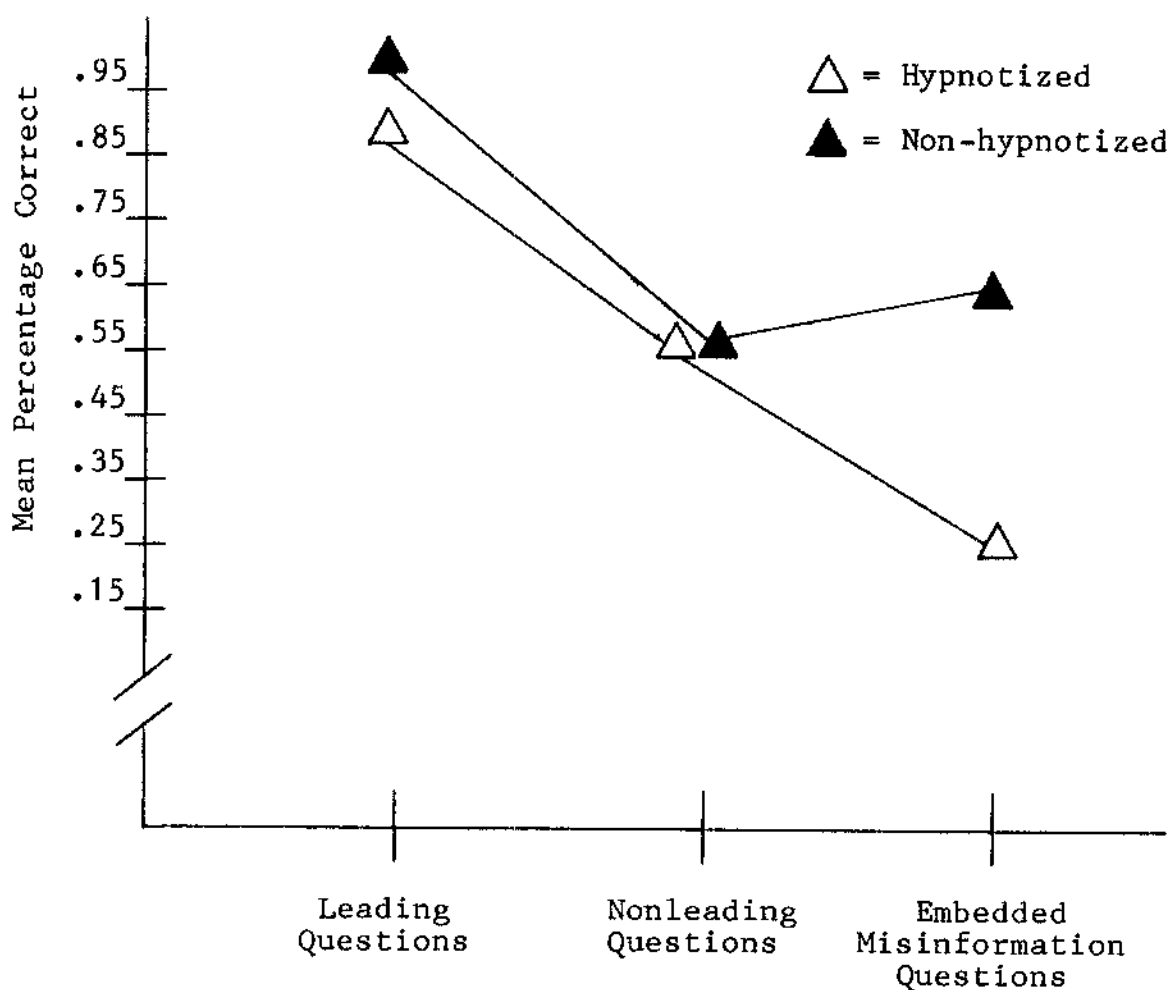


Figure 1. Mean percentage correct for three question formats as a function of hypnosis.

hypothesis that no significant differences would be found on non-leading questions between hypnosis and non-hypnosis procedure subjects. However, the interaction results fail to support the first hypothesis that hypnosis procedure groups would score significantly lower on the leading format questions. A Neuman-Keul's post-hoc analysis showed that responses to leading questions were significantly different from both non-leading and embedded misinformation questions, $p < .01$. This analysis indicates that leading questions were answered at the highest level of accuracy for both hypnosis and nonhypnosis procedure subjects. Finally, in opposition to the fifth hypothesis, high state anxiety did not effect subjects' scores on any of the question formats (refer to Table 1, Appendix D).

Confidence Rating Data

The confidence rating data were analyzed in a 2 x 2 x 3 analysis of variance by film (low- versus high-anxiety) x hypnosis (hypnotized versus non-hypnotized) x question format confidence (leading, nonleading, & embedded misinformation) with confidence ratings serving as the repeated measure. From Table 4 (Appendix D) it appears the means clustered around moderate confidence ratings for each of the three question formats. As seen in Table 5 (Appendix D), nonsignificant differences were found between the groups. These results do not support the fourth hypothesis that hypnosis procedure subjects would be more confident of their

reponses to all question formats compared with non-hypnosis procedure subjects.

State Anxiety

State anxiety was assessed before and after the film presentation with the Eight State Questionnaire: Forms A and B, respectively (8SQ:A; 8SQ:B; Cattell, 1976. From Table 6 (Appendix D), it appears that only the type of film (high anxiety film) had an effect on the dependent measure. These apparent differences were analyzed with a two-way analysis of covariance involving film (low- versus high-anxiety) x hypnosis (hypnotized versus non-hypnotized), with pretest anxiety serving as the covariate and post-test anxiety as the dependent measure. As shown in Table 7 (Appendix D) this yielded a significant main effect only for film type indicating that the two films evoked significantly different levels of state anxiety, $F(1,35) = 15.65, p < .001$.

A second 2 x 2 (film x sex) analysis of covariance also used pretest anxiety as the covariate and post-test anxiety as the dependent variable. Table 8 (Appendix D) suggests that the subjects' sex had no effect on the dependent variable, while film type again appears solely responsible for the observed differences. Here again, as shown in Table 9 (Appendix D) only the main effect for film type reached statistical significance, $F(1,35) = 17.48, p < .001$, demonstrating the potent impact which the high-anxiety film had on subjects' state anxiety.

Discussion

The results of the present study support two of the five research hypotheses and are generally more congruent with the reconstructive theory of memory than the memory-permanence theory. The results will be discussed in light of these two opposing memory theories.

Accuracy of Recall Results

In this investigation, non-hypnosis procedure subjects scored significantly more accurately (more correct answers) on embedded misinformation questions than hypnosis-procedure subjects. This supports the third hypothesis that hypnosis procedure subjects would respond less accurately on embedded misinformation questions than non-hypnosis procedure subjects. Here, those given the hypnotic induction were more easily influenced by the embedded misinformation to report "remembering" plausible, yet nonexistent details, than were their non-hypnosis procedure counterparts. In contrast, non-hypnosis procedure subjects were more "immune" to erroneous reconstruction of their memories when subjected to the same misinformation. Therefore, hypnotic induction appears to produce a heightened suggestive state which makes the memory process more malleable and consequently more easily altered by embedded misinformation beyond an individual's awareness.

No significant differences were found between the groups on accuracy for non-leading questions, supporting the

second hypothesis that the hypnosis procedure would not facilitate recall for this question format. These data stand in contrast to the memory-permanence theory espoused by hypnoinvestigators, and question their assertion that perceived events are stored automatically and veridically in long-term memory. So, contrary to claims based upon the memory-permanence theory that hypnosis facilitates the location and retrieval of immutable memory traces, the present results lend support to the reconstructive theory of memory.

Finally, previous researchers have shown hypnotized subjects less accurate on leading format questions compared with non-hypnotized subjects (Putnam, 1979; Zelig & Beidleman, 1981). Although the present investigation involved similar methods and an identical format for the leading questions, nonsignificant differences were obtained between the groups. In fact, leading questions were answered at the highest rate of accuracy for both hypnosis and non-hypnosis procedure subjects. Therefore, the first hypothesis that hypnosis procedure groups would score lower on the leading questions than non-hypnosis procedure groups was not supported. Apparently the leading questions were not difficult enough to avoid the potential danger of a ceiling effect. The leading questions were written using nonexistent, yet plausible items. These items were operationally defined as those "identified" by at least

25 per cent of the pilot-study subjects (Loftus, 1979; Putnam, 1979; Zelig & Beidleman, 1981). This allowed for the construction of leading questions which would be answered correctly in the negative direction, in order to test for the veridicality of memory (Putnam, 1979; Zelig & Beidleman, 1981). The operational definition of "plausible" may have been too lenient considering the small sample size of the pilot study ($N = 16$), yielding instead implausible items. If so, the leading questions used in this investigation may have been blatantly implausible. This may explain why most subjects correctly rejected the majority of the leading questions.

This explanation could help account for why accuracy was so high for both hypnosis procedure and non-hypnosis procedure groups, coupled with nonsignificant differences between the groups. Nevertheless, additional research in this area is warranted to further investigate these discrepant findings.

In general, the question format results stand in contradistinction to claims made by proponents of the memory-permanence theory who support the use of hypnosis for improving memory recall of eyewitnessed events. Conversely, these results are more consistent with claims made by those who support a reconstructive theory of memory who state that memory is an ongoing, fluid process, affected and potentially altered by subsequent input like embedded

misinformation. While this poses an important question and problem for those who believe that events are represented veridically somewhere in long term memory, it introduces an interesting and potentially useful application of hypnosis for psychotherapy. If an individual's memory for traumatic events can be rendered more changeable or malleable by hypnosis, then it seems possible that during hypnotherapy a psychotherapist could use embedded misinformation to help reconstruct a client's memory of a traumatic event.

However, this raises important ethical considerations pertaining to therapist-client values, issues of control and personal responsibility, and individual choice. In any case, it is essential that the therapeutic contract delineate the methods and rationale of this kind of treatment. Finally, the therapist must obtain the client's informed consent before using such procedures.

Confidence Rating Results

Each subject provided a confidence rating of his/her perceived accuracy for all 20 responses on the questionnaire. A likert-scale from one to five was used where "one" represented a guess and "five" represented absolute certainty. No significant differences were found between the groups on their confidence ratings which correspond to the three question formats. Therefore, the fourth hypothesis that hypnosis procedure subjects would be more confident of the accuracy of their responses to all three question

formats than non-hypnosis procedure subjects was not supported. The underlying assumption was that hypnotic induction would produce an expectancy of improved memory in these subjects over those in the non-hypnosis procedure groups. However, the results indicated that all groups clustered around moderate confidence ratings for each form of question. Previous researchers in this area have found higher confidence ratings among hypnotized subjects than non-hypnotized subjects (Putnam, 1979; Zelig & Beidleman, 1981). This may be explained by a particular "set" these researchers gave their hypnotized subjects that they would remember very clearly by slowing down and zooming in on the details needed to answer the questions correctly. Although the four experimenters in the present investigation used a similar set with their hypnosis procedure subjects, all may not have produced as strong a set as previous experimenters. Therefore, hypnotic induction may not be solely responsible for differences in confidence ratings. Instead, the experimenter-hypnotist's introduction, explanation, and style may prove more important than a hypnotic state in producing an expectancy of being accurate.

Film Type and Anxiety

Film type (low- versus high-anxiety) had no apparent effect on the questionnaire results, failing to support the fifth hypothesis that subjects who viewed the high-anxiety film would score lower on all question formats compared with

subjects who viewed the low-anxiety film. However, the two two-way analyses of covariance indicate that the two films evoked significantly different levels of anxiety. Hypnosis and non-hypnosis procedure subjects who saw the high-anxiety film, which included the graphically depicted accident, experienced significantly higher state anxiety than their counterparts who saw the low-anxiety film. However, high state anxiety did not negatively effect the subjects' accuracy on any of the three question formats. Once again these results call into question the supposition made by hypnoinvestigators that the reason hypnosis works to help witnesses/victims recall otherwise inaccessible facts surrounding a serious accident or crime is that hypnosis lowers the defensive guard thrown up against fright, anxiety, and trauma (Stratton, 1977; Stump, 1975; Reiser, 1976, 1978). Note, however, that proponents of the memory-permanence theory emphasize an important difference between laboratory research and actual situations. They do not believe that anxiety elicited in the laboratory can be reliably compared to the degree and quality of anxiety experienced by people involved in real accidents or crimes. This criticism cannot easily be dismissed and defines an important area of research that cannot be carefully controlled. Such naturalistic research is not amenable to rigorous controls so experimental laboratory studies attempt to approximate the natural field.

Summary

Overall, the results of the present study are more congruent with the reconstructive theory of memory than with the memory-permanence theory and call into question the use of hypnosis for investigating eyewitness memory. Memory may best be conceptualized as an active, ongoing, fluid process subject to modification at three points: (1) acquisition of original experience, 2) acquisition and integration of subsequent, new information, and (3) regeneration of an altered memory representation (Loftus, 1975). In the present investigation, embedded misinformation served as the modification agent at the acquisition and integration stage in Loftus' (1975) reconstructive memory process model above, resulting in a reconstructed memory of nonexistent details. In fact, contrary to statements by those who adhere to the memory-permanence theory that hypnosis facilitates the location and retrieval of permanently stored memories, this study found that hypnotic induction either altered memory (embedded misinformation) or had no beneficial effect at all (nonleading and leading questions). Conclusions from these findings suggest that the legal and judicial systems should use hypnosis conservatively for investigative purposes, pending further controlled field research. Finally, a new, potentially useful extension of this study, and an area also requiring research, is the application of hypnosis and embedded misinformation for psychotherapeutic purposes.

Limitations

In criticism of the present study, four limitations are noted. First, the hypnosis procedure subjects were taken through one induction before being asked to respond to the questionnaire. In real situations an eyewitness may be hypnotized numerous times resulting in deep hypnosis before being questioned. Second, a ceiling effect may have decreased the strength of the leading questions, thereby hiding differences between the groups which may have existed. Third, eyewitnesses in real situations may be more aware of the need for remembering the events of an accident than were the subjects in the present study who watched a brief film of a serious accident. Finally, increasing the number of subjects and adding a field depth test for hypnosis would improve the design of this study.

Appendix A

Pilot Experiment

The purpose of the pilot experiment was to determine the degree of state anxiety associated with two short videotape segments taken from the industrial safety film, "Shake Hands With Danger" (Clifford & Harvey, 1979). The hypothesis was that the videotape segment including the graphic depiction of a staged shop accident would elicit significantly higher state anxiety than the segment without the graphic scenes.

Method

Subjects

Sixteen male and female undergraduate students at North Texas State University volunteered to participate. They received extra credit towards their final course grade for their assistance. Equal numbers of males and females were randomly assigned to one of two groups. The first group was presented only didactic information on the steps involved in changing a large "bucket" on a land moving Caterpillar tractor. The second group was shown the identical segment of didactic material as group one, plus a 5-second additional segment involving a staged accident.

Materials

The two color videotape excerpts were equivalent in length (high anxiety excerpt = 65 seconds; low anxiety excerpt = 65 seconds minus the 5-second ending of graphic

accident) and identical in content with the exception of the final graphic depiction of a serious accident in the high-anxiety version. The short duration of these videotape clips approximate the length of time involved in actual eyewitness exposure to serious accidents or crimes. Both excerpts exposed subjects to events and didactic material surrounding the replacement of a "bucket" on a large land-moving Caterpillar tractor. First, two men are shown standing by the large bucket and linkage to the hydraulic lift of the tractor. One of the men appears uncertain of how to properly perform the job. The second man, apparently more experienced in such procedures, begins to take over, demonstrating the sequence of steps necessary in completing the task. The last maneuver before inserting the pin, which locks the bucket into the hydraulic lift-arm linkage, is the application of lubricant inside the coupling. Instead of using the proper tool, he carelessly packs the inside of the coupling with grease using his bare hand and wrist. Meanwhile, the operator inside the tractor cab is distracted and stung by a wasp.

Up to this point, the film segments are identical. But in the high-anxiety arousing excerpt, the cab operator, in an attempt to swat the wasp, accidentally hits the hydraulic lift control causing the metal linkage of the lift arm inside the coupling, and enveloping the man's wrist, to raise, thereby amputating the man's hand from his wrist.

Conversely, the low-anxiety arousing excerpt stops at the point in the film where the cab operator is stung by the wasp.

The Eight State Questionnaire: Forms A and B (8SQ:A; 8SQ:B; Cattell, 1976). The 8SQ was designed for measuring eight important emotional mood states. Both forms of 8SQ contain 96-items; 12 items per scale which measure each state. It may be used with adults and adolescents 16 years of age and older, administered either individually or in groups.

Only the anxiety scale from the 8SQ: Forms A and B was used. The sole use of the anxiety scale should not affect the validity or reliability of the 8SQ because reliability and validity coefficients were determined separately for each individual scale (D. Madsen, personal communication, April 1983).

The 48-item checklist. A 48-item checklist containing 31 existent and 17 nonexistent items was administered to each subject after watching the appropriate film (Appendix E). This checklist asked subjects to indicate only the items they remembered, and to estimate their confidence of the recalled items using a five-point scale. On the confidence scale, "one" represented a guess and "five" absolute certainty. The checklist and confidence rating scale helped determine the difficulty for each detail. In addition, the confidence ratings for the "recalled"

non-existent items determined item selection for developing the leading and embedded misinformation questions for the 20-item questionnaire in the main investigation.

Procedure

All subjects completed the Eight State Questionnaire: Form A (8SQ:A) to assess their level of state anxiety before watching a film. Then subjects in group one watched the didactic, only film segment while subjects in group two viewed the didactic, plus graphic accident film segment. Following the completion of these films, all subjects responded to the Eight State Questionnaire: Form B (8SQ:B). Finally, subjects in both groups completed the item-checklist, were debriefed, and thanked for their participation.

Results and Discussion

State anxiety scores as measured by the Eight State Questionnaire: Forms A and B (8SQ:A, 8SQ:B) were converted to STEN scores as specified in the interpretation manual. From inspection of the means in Table 10 (Appendix D) it appears the two films differed on the degree of post-state anxiety elicited. These apparent differences were analyzed using a one-way analysis of covariance involving film (didactic, only versus didactic, plus graphic accident), with pretest anxiety serving as the covariate and post-test anxiety as the dependent variable. As shown in Table 11 (Appendix D), the didactic film, plus graphic accident produced significantly higher state anxiety than the

didactic film, only, $F(1, 13) = 6.40, p < .05$. Therefore, it was concluded that the graphic accident film was potent for eliciting higher state anxiety than the didactic film alone. These two films were designated as the high-anxiety film and the low-anxiety film, respectively. Consequently, the high-anxiety film taken from the industrial safety film, "Shake Hands With Danger," was equated with the industrial safety film, "It Didn't Have to Happen" in evoking anxiety similar to that experienced by eyewitnesses to serious accidents or crimes (Zelig & Beidleman, 1981).

The item-checklist yielded 19 existent and eight non-existent items with a confidence rating of two or higher. These items were used in developing the leading, non-leading, and embedded misinformation questions for the 20-item questionnaire used in the main experiment.

Appendix B
Questionnaire

Name _____ Condition _____ Date _____

EXPERIMENTERS: Read the following statement to all subjects before asking the questions. Then, circle their answers and record their confidence ratings beside their answers.

"You saw 3 men involved in changing a bucket on a large tractor: The Cab Operator; the Foreman, Bill Myers, who was in charge of the job; and the Assistant (to Bill Myers). Please refer to these 3 men when answering questions."

"After answering each question, you will be asked to give a Confidence Rating of your answer using a one to five point sliding scale. On this scale, one represents a guess, while five represents absolute certainty, with the other numbers accordingly, in-between. If you want a question repeated, say 'repeat.' Do you have any questions?"

1. Did you see Bill Myers carry a square box of grease with him before beginning the job?
 - A) yes
 - B) no
2. Did you see a wasp sting the cab operator on his arm?
 - A) yes
 - B) no
3. After removing his safety gloves, what did the assistant do while Bill Myers knelt beside the tractor bucket?
 - A) sat down
 - B) looked for a tool
 - C) held the bucket in place with a crow bar
4. What color was Bill Myers' hard hat?
 - A) white
 - B) yellow
 - C) blue
5. What did the cab operator wear?
 - A) a blue t-shirt and jeans
 - B) striped coveralls
 - C) work shirt and jeans
6. Did you see Bill Myers carry a tool with him before beginning the job?
 - A) yes
 - B) no

7. Did you see the wrist watch?
A) yes
B) no
8. As the men were working on the job, did you notice the man on the blue tractor behind them?
A) yes
B) no
9. Did you see a wasp sting the cab operator above his knee?
A) yes
B) no
10. What did the man with the mustache do with the coupling pin at the beginning of the film?
A) placed it on top of the tractor bucket
B) placed it on top of the tool chest
C) handed it to the other man
11. Did you see a tractor behind the tool chests?
A) yes
B) no
12. Did you see a crescent wrench on Bill Myers belt?
A) yes
B) no
13. Did you notice the fire extinguisher hanging on the wall?
A) yes
B) no
14. Did you see the wedding band?
A) yes
B) no
15. Who wore safety goggles?
A) only Bill Myers
B) Bill Myers and the assistant
C) all 3 men wore them
16. Did you see the first-aid kit?
A) yes
B) no
17. Did you see a truck behind the tool chests?
A) yes
B) no

18. Did you see a crescent wrench on a table?
A) yes
B) no
19. Did you see a pair of safety gloves?
A) yes
B) no
20. Did you see a man with a mustache?
A) yes
B) no

Appendix C

Research Consent Form

The experiment in which you may decide to participate is intended to gain information which could prove valuable to both the field of psychology and to our society's legal-judicial system. As a participant in the present study, you may be exposed to sudden emotionally arousing stimuli and may also be subsequently hypnotized. The type of sudden emotionally arousing stimulus to which you may be exposed has been safely used in previous research. Through your participation you will be given an opportunity to learn self-hypnosis skills for deep relaxation and for increasing your self-confidence.

The researchers will gladly answer your questions concerning the procedures of this experiment as well as provide you with a full explanation of its purposes after all data are collected. Your participation is strictly voluntary and you are free to withdraw your consent and discontinue participation in this project at any time without prejudice. Names will not be used on any of the experimental data in order to insure confidentiality.

I understand completely the conditions required and agree to participate in the above study.

Signed: _____ Date _____

Witness: _____

Experimenter: _____

Appendix D

Table 1

Means and Standard Deviations of Correct Responses
for Three Question Formats as a Function
of Hypnosis and Film

Condition	<u>n</u>	Question Format		
		Leading	Non-leading	Embedded Misinformation
Hypnotized/Low				
Anxiety Film	10			
\bar{X}		.88	.54	.30
SD		.14	.09	.26
Non-hypnotized/				
Low Anxiety Film	10			
\bar{X}		.96	.57	.55
SD		.08	.17	.50
Hypnotized/High				
Anxiety Film	10			
\bar{X}		.88	.57	.25
SD		.17	.14	.35
Non-hypnotized/				
High Anxiety Film	10			
\bar{X}		.96	.55	.70
SD		.08	.16	.42

Table 2

Analysis of Variance with Repeated Measures Using
Question Format Comparing Film by Hypnosis
for Mean Correct Responses

Source	MS	df	F
Film	0.0097	1	0.12
Hypnosis	0.6274	1	7.80*
Film x Hypnosis	0.0178	1	0.2
Error	0.0804	36	
Question	2.4317	2	43.97***
Film x Question	0.0077	2	0.14
Hypnosis x Question	0.3309	2	5.98**
Film x Hypnosis x Question	0.0447	2	0.18
Error	0.0553	72	

* $p < .01$.

** $p < .005$.

*** $p < .001$.

Table 3

Neuman-Keul's Matrix on ANOVA with Repeated
Measures Using Question Format Comparing
Film Type by Hypnosis for Mean
Correct Responses

	HNL	WNL	WEM	HL	WL
HEM	5.31*	5.38*	6.66*	11.51*	13.03*
HNL		0.08	1.35	6.20*	7.72*
WNL			1.27	6.12*	7.65*
WEM				4.85*	6.37*
HL					1.52

Note. HL = Hypnotic-leading; HNL = Hypnotic-nonleading;
HEM = Hypnotic-embedded misinformation; Waking-leading; WNL
= Waking-nonleading; WEM = Waking-embedded misinformation.

Note. Neuman-Keul's underline summary for .01 significance
level: HEM HNL WNL WEM HL WL.

*p < .01.

Table 4

Means and Standard Deviations of Confidence Ratings
for Three Question Formats as a
Function of Hypnosis and Film

Condition	<u>n</u>	Confidence Ratings		
		Leading	Non-leading	Embedded Misinformation
Hypnotized/Low				
Anxiety Film	10			
\bar{X}		3.46	3.58	3.60
SD		.93	.70	.97
Non-hypnotized/				
Low Anxiety Film	10			
\bar{X}		3.36	3.25	3.10
SD		1.33	.56	1.24
Hypnotized/High				
Anxiety Film	10			
\bar{X}		3.82	3.64	3.80
SD		.88	.48	1.16
Non-hypnotized/				
High Anxiety Film	10			
\bar{X}		3.96	3.24	3.50
SD		.89	.36	1.20

Table 5

Analysis of Variance with Repeated Measures Using Confidence Ratings Comparing Film by Hypnosis for Mean Confidence Ratings for Three Question Formats

Source	MS	df	F
Film	2.1498	1	1.34
Hypnosis	1.8712	1	1.17
Film x Hypnosis	0.1194	1	0.07
Error	1.6060	36	
Confidence	0.5174	2	0.98
Film x Confidence	0.5298	2	1.01
Hypnosis x			
Confidence	0.5481	2	1.04
Film x Hypnosis			
x Confidence	0.0671	2	0.13
Error	0.5264	72	

Table 6
Means and Standard Deviations of Pre- and
Post-Anxiety Scores as a Function of
Film and Hypnosis

Condition	<u>n</u>	Pre- Anxiety	Post- Anxiety	Adjusted Post-Anxiety
Hypnotized/Low				
Anxiety Film	10			
\bar{X}		5.40	5.50	5.26
SD		1.58	1.72	
Non-hypnotized/				
Low Anxiety Film	10			
\bar{X}		5.00	5.10	5.15
SD		1.56	1.45	
Hypnotized/High				
Anxiety Film	10			
\bar{X}		5.00	6.30	6.35
SD		2.40	1.64	
Non-hypnotized/				
High Anxiety Film	10			
\bar{X}		4.90	5.90	6.03
SD		1.52	1.29	

Table 7

Analysis of Covariance Comparing Film by Hypnosis
for Post-Anxiety Scores Using Pre-Anxiety
as the Covariable

Source	MS	df	F
Film	9.613	1	15.65*
Hypnosis	0.468	1	0.76
Film x Hypnosis	0.120	1	0.20
Covariate	62.905	1	102.43*
Error	0.614	35	

* $p < .001$.

Table 8

Means and Standard Deviations of the Pre- and
Post-Anxiety Scores as a Function
of Film and Sex

Condition	<u>n</u>	Pre- Anxiety	Post- Anxiety	Adjusted Post-Anxiety
Male/Low Anxiety				
Film	10			
\bar{X}		5.30	5.50	5.33
SD		1.34	1.51	
Female/Low Anxiety				
Film	10			
\bar{X}		5.10	5.10	5.08
SD		1.79	1.66	
Male/High Anxiety				
Film	10			
\bar{X}		4.50	6.10	6.54
SD		1.90	1.37	
Female/High Anxiety				
Film	10			
\bar{X}		5.40	6.10	5.85
SD		2.01	1.60	

Table 9
Analysis of Covariance Comparing Film by Sex
for Post-Anxiety Scores Using Pre-Anxiety
as the Covariable

Source	MS	df	F
Film	9.745	1	17.48*
Sex	2.147	1	3.85
Film x Sex	0.462	1	0.83
Covariate	65.692	1	117.86*
Error	19.509	35	

* $p < .001$.

Table 10
 Mean Pre- and Post-Anxiety Scores
 as a Function of Group for the
 Pilot Experiment

Group	<u>n</u>	Pre- Anxiety	Post- Anxiety
Didactic Film, Only	8		
\bar{X}		6.000	6.125
Didactic Film, Plus			
Graphic Accident	8		
\bar{X}		6.125	7.375

Table 11

Analysis of Covariance by Group for Post-Anxiety
Scores of the Pilot Experiment Using
Pre-Anxiety as the Covariable

Source	MS	df	F
Film	5,263	1	6.398*
Covariate	34.057	1	41.404**
Error	.823	13	

* $p < .05$.

** $p < .001$.

Appendix E

Item Checklist

Directions: (1) Please mark a Check (✓) in the space beside each item you remember, ON LEFT SIDE OF ITEM.

(2) Using the five-point scale below, please indicate how confident you are of your recollection, ON RIGHT SIDE OF ITEM.

1 Guess	2	3	4	5 Absolutely Certain
<input type="checkbox"/> Blue hard hat				<input type="checkbox"/> Exhaust pipe
<input type="checkbox"/> Safety gloves				<input type="checkbox"/> Green partition
<input type="checkbox"/> Crow bar				<input type="checkbox"/> Fire extinguisher
<input type="checkbox"/> Hammer				<input type="checkbox"/> Blue tractor in background
<input type="checkbox"/> Brown hair				<input type="checkbox"/> Red tool chests
<input type="checkbox"/> Green t-shirt				<input type="checkbox"/> Wasp stinging man's knee
<input type="checkbox"/> White hard hat				<input type="checkbox"/> Man on blue tractor
<input type="checkbox"/> Blue t-shirt				<input type="checkbox"/> Welding helmet
<input type="checkbox"/> Red hair				<input type="checkbox"/> Trees behind tractor
<input type="checkbox"/> Coupling pin				<input type="checkbox"/> Bill Myer's name tag on shirt
<input type="checkbox"/> Square box of grease				<input type="checkbox"/> Blond hair
<input type="checkbox"/> Crescent wrench				<input type="checkbox"/> Yellow tractor in in background
<input type="checkbox"/> Wrist watch				<input type="checkbox"/> "MAC TOOLS" emblem on cover
<input type="checkbox"/> Yellow hard hat				<input type="checkbox"/> Glasses
<input type="checkbox"/> Windshield wiper				<input type="checkbox"/> Mustache
<input type="checkbox"/> First-aid kit				<input type="checkbox"/> Wedding band (ring)
<input type="checkbox"/> Wasp				<input type="checkbox"/> Telephone on wall

<u> </u> Yellow tractor <u> </u>	<u> </u> Sky light <u> </u>
<u> </u> Tractor motor on <u> </u>	<u> </u> Bumblebee <u> </u>
<u> </u> 2 Hydraulic levers <u> </u>	<u> </u> Flash light <u> </u>
<u> </u> Tape measure <u> </u>	<u> </u> Wrench on bill Myer's belt <u> </u>
<u> </u> Large letter "A" <u> </u>	<u> </u> Heard man scream <u> </u>
<u> </u> Smoke outside bldg <u> </u>	<u> </u> Heard bones snapping <u> </u>
<u> </u> Other items; Please list:	<u> </u> Grease gun <u> </u>
	<u> </u> Safety helmet <u> </u>

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