

GROUP PERFORMANCE ON FREE RECALL MEMORY TASKS  
AS A FUNCTION OF WORD IMAGERY AND  
VERBALLY INDUCED ALTERED STATES  
OF CONSCIOUSNESS

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## CHAPTER I

### THE RESEARCH PROBLEM

#### Introduction

The past several decades have witnessed a tremendous expenditure in time, money, and effort, in an attempt to explore and determine the "how" of effective education and various ways in which that process might be facilitated. Philosophies and underlying assumptions as well as opinions abound. Regardless of one's point of view, the question of, "how might education be more effectively carried out?" remains one of the more controversial, confusing, and embarrassing questions that can be asked of someone professionally associated with education and its Pandora's Box of intricate and subtle variables. Fads of one nature or another have come and gone with relatively few having left lasting impressions.

That the education process is an extremely complex phenomenon is perhaps one of the few universally accepted statements that can be made. A hundred years of intensive, systematic research has not exhausted the variables thought to be involved. Its systematic study has resulted in voluminous amounts of data from which relatively few really important findings have been derived. Though many of the studies can be characterized as interesting, most can also be characterized by, so what? Studies have often lacked possible application or

theoretical utility. In reality, few things about the process of education have changed much in the recorded history of education. If, for the intent and purpose of this discussion, the field of education can be narrowed to that of the undergraduate university classroom, the lack of meaningful change becomes more apparent. With few exceptions, today's college classroom bears a striking resemblance to that of the medieval university of several hundred years ago. The methods and techniques are virtually the same, consisting primarily of one person placing himself at the front of a group of students and proceeding to lecture/discuss the information to be learned to/with them. Cole (1950) describes a medieval university classroom from a woodcut.

Several pictures and descriptions of university classrooms are extant . . . shows a dignified gentleman, complete with beard, addressing a group of students. Teacher and students wear academic robes. The students are portrayed as being well beyond the first flush of youth. Two of them in a corner seem to be having a private argument, and another has evidently gone to sleep! (p. 184)

Excepting the wearing of academic robes, the author could just as well have been describing a modern university classroom. She continues with a description of medieval classes, students, and their behavior in and out of class.

At five or six o'clock each morning the great cathedral bell would ring out the summons to work. From the neighboring houses of the canons, from the cottages of the townsfolk, from the taverns and hospices and boarding houses, the stream of the industrious would pour into the enclosure beside the cathedral. The master's beadle, who levied a precarious tax on the mob, would strew the floor of the lecture hall with hay or straw, according to the season, bring the master's textbook, with the notes of the lecture between the lines or on the margin, to the solitary desk, and then retire to secure silence in the adjoining street. Sitting on their haunches in the hay, the right knee raised to serve as a desk for the waxed

tablets, the scholars would take notes during the long hours of lecture (about six or seven), then hurry home ----- if they were industrious ----- to commit them to parchment while the light lasted. (p. 184)

The similarities between then and now are obvious. Learning on the part of students consisted primarily of memorization as noted by Cole (1950): "The lessons, when not dictated and learnt by heart from notes, were got up from bald epitomes." (p. 193) When recently asked about instructional methodologies used, an instructor recently selected as one of the outstanding teachers at Oklahoma State University described a process whereby notes were read to students, the students were then expected to memorize them to the point of being able to relate them on a subsequent test over the material (Dorris, 1980). A thirteenth century teacher of the law stated his instructional methodology thus:

First, I shall give you summaries of each title before I proceed to the text; secondly, I shall give you as clear and explicit a statement as I can of the purport of each Law (included in the title); thirdly, I shall read the text with a view to correcting it; fourthly, I shall briefly repeat the contents of the Law; fifthly, I shall solve apparent contradictions, adding any general principles . . . and any distinctions or subtle and useful problems arising out of the Law with their solutions, as far as the Divine Providence shall enable me. And if any Law seem deserving, by reason of its celebrity or difficulty, of a repetition, I shall reserve it for an evening repetition (Eby and Arrowood, 1940, p. 785).

Again, with a few rather minor exceptions, this could be representative of many instructor's standard first class of the semester introductory lecture informing students as to how the class will be conducted.

The similarities are not necessarily exhausted by the methodologies inherent in the lecture method. Other parallels include the assumptions, often covert and implicit, that continue to be made by those conducting

formal education. In the university classroom it seems an unstated axiom that; (1) all students learn in the same way, (2) that students can effectively and efficiently learn the material under consideration by listening to a lecture or participating in a limited discussion about the material, and, (3) that students are passive recipients of information, much like empty bottles of various sizes, all waiting to be filled to the same level. These unstated assumptions are side effects of the lecture method which in turn has to some extent been dictated by the economics of educating masses of people. Evidence that these assumptions, or at least some of them, may be valid is demonstrated and maintained by the success of at least a few of the students. That these students may have succeeded despite the system rather than because of it is not often considered. However that may be, the question remains whether given the limitations of the current university classroom, including the lecture method, the learning process taking place there can be facilitated.

One must necessarily wonder about a method of instruction that has endured so long. As mentioned previously, economics has undoubtedly played an important role in its survival, as the instruction of groups has probably allowed the education of the general population to occur. It could be argued that a lack of viable alternatives has been a major contributing factor. Generally, if one desires to know about how a process takes place, it is usual to consult the discipline that concerns itself with the study of that process. Examining a current educational psychology textbook, one finds discussions of various classic theories of learning, instructional materials and objectives, student and teacher characteristics, motivation, types of

knowledge and learning, attitudes, memory, personality, and the evaluation and measurement of student and program progress (West and Foster, 1976). Fortunately or unfortunately, as the case may be, the vast majority of college instructors have been exposed to neither a course in educational psychology nor an educational methods course. When an instructor walks into a classroom a regression typically takes place. A regression back to the methods and techniques utilized previously to teach the teacher as a student, including the afore mentioned assumptions, and the cycle continues.

Research into the teacher-student interaction that results in learning has taken several forms. Most of them can be separated into two major areas. The first of these areas has dealt primarily with environmental factors, variables such as physical surroundings, types of materials to be learned, media of presentation, the schedule, amount, and types of reinforcer used, socio-economic status, teacher characteristics, and mode of instruction to name a few. The other major area has attempted to look at factors indigenous to the learner, and has typically been concerned with such variables as intelligence, personality, motivation, cognitive style, and attitudes. That all these variables are of importance cannot be denied. The question, however, remains. Given the confines of the university classroom, can the learning process be facilitated, thus possibly shortening the seemingly endless repetition of the instructor restating what is in the textbook, the student reading, then rereading the textbook and notes immediately preceding an examination over the same material. With the exception of the construct of anxiety, the state of the organism while learning has received relatively little attention outside the investigation of

drug induced states in animals. Learning in a college classroom is traditionally assumed to occur at its optimal level when the student is alert, fully awake, and to some extent in a tensed state. While the lecture method is apt to remain the major economically viable mode of instruction for undergraduate education it remains to be seen whether alterations of the student's state of awareness might enhance learning under the lecture method.

That the normal waking state is the best one for everything except sleep has recently been called into question. Tart (1969) speaks to the use of altered states of consciousness in a positive sense and talks of their potential importance. He also describes western civilization's infatuation with the normal awake state while ignoring other possibilities. Huxley (1962) develops an entire novel around a small culture's use of altered states of consciousness for various purposes including education. Houston (1973) talks of unexplored human potentials and the breaking out of the cultural trance that assumes that the normal awake state is the only one of any significance. The recent interest in meditation is an example and is exemplified by a rapidly expanding literature (Carrington, 1978) claiming a number of advantageous benefits.

Education and psychology have found the state of consciousness of the learner difficult to investigate as an independent variable affecting learning. The state of the learner in this sense has defied meaningful operational definition and has resisted attempts to hold it constant or to vary it systematically with any precision to study its effects. Tart (1969) points out that in all likelihood each person goes through a large number of altered states in any given day, most of

which are culturally categorized as the normal awake or sleeping state. Perhaps, it is time for the state of awareness of the learner to be taken more seriously as it relates to learning.

Relatively little consistent data currently exist concerning the systematic effects of various states of consciousness of the learner on acquisition and subsequent retention of information learned, especially as related to naturally occurring groups of learners comprising classroom situations. The existing research is divided on the facilitating effects of altered states and has typically been performed with highly selected groups of subjects when groups were used at all. Rather, old educational maxims tend to be passed from one generation of college professors to the next. One such rule of thumb states that any given class of students will naturally fall into thirds (White, 1977). Roughly one third of the students are thought to be "with" the instructor, actively involved with what is being said and discussed. A second third is said to have been in "never-never land" since having taken their seats, with the final third drifting back and forth between the extremes of the previous two. Once the maxim has been stated, it is often verified in the experience of the instructor. Need this necessarily be the case? Dickens (1854) wrote a novel incorporating the analogy of students as vessels, and instructors as pitchers, pouring the vessel-student full of knowledge to capacity. The shape of the bottle referring to what types of information the student can learn and the size of the bottle referring to how much can be learned, has historically been emphasized. Perhaps this is misleading. Using the bottle analogy for a moment, perhaps the shape and size of the bottle are not as important as the neck, the site where the information must

come through before it can be acted upon in any meaningful fashion. Perhaps the maxim of classes falling into thirds could be related to the student-bottle analogy. In regard to information to be processed outside the individual as opposed to inside the individual, the students "with" the instructor could be characterized as bottles with wide, open necks; the third of the class in "never-never land" as having narrowed the bottle neck so that private information can be processed, becoming impervious to the discussion; and the third in between the two extremes as vacillating somewhere in between, on occasion tuning into the discussion and at other times tuning out and attending to privately generated information.

An alternative model might be that presented by Broadbent (1958) applied to attention, wherein a "Y" model of attention is used to illustrate selective attention. If one leg of the "Y" could be thought to represent attention to outside sources of stimulation, primarily the instructor, and the other as attention to privately, internally generated information, for example fantasy, then the bottle analogy and the "Y" analogy would seem to reach similar conclusions. In a common sense type of approach either model would seem to describe adequately the experience of instructors in the classroom. Some instructors intuitively develop or are conditioned by students to use methods and techniques designed to have some effect on the narrow and vacillating necks of the bottle-students. These techniques range from telling jokes to varying the tone and volume of the voice, to moving from one side of the room to the other, to making eye contact with each student. Such tactics, if effectively used, could have the effect of limiting some of the vacillation of the middle third of the class and opening



the narrow necked bottles, or, alternatively closing the leg of the "Y" used for the processing of private information interfering with the material to be learned from the external source.

Any technique intended to facilitate learning by affecting the students state of awareness and used in conjunction with the lecture method would seem required to meet the following qualifications;

(1) it must be applicable to groups, (2) students should experience it as being a positive or at least a neutral procedure, (3) it should avoid the negative connotations of brainwashing or coerced group conformity, and, (4) the state must be capable of being quickly induced and easily attained by the students. Any procedure requiring more than ten minutes to induce would seem counter productive unless it could be demonstrated to result in dramatic improvement. Of the techniques currently available that might efficiently supplement the lecture method while significantly affecting the state of awareness of the student and meeting the four requirements listed above, relaxation would seem to hold some promise. Relaxation has been implicated as having advantageous effects on learning (Rosenthal, 1944) while the effects of the closely related phenomenon of hypnosis has consistantly received mixed reviews (Barber and Calverley, 1966). Suggestology, another closely related system acclaimed as facilitating the learning of some types of material, appears to utilize both relaxation and a hypnotic trance induction procedure to accomplish its goal of accelerated learning. Relaxation has been implicated as the central if not the defining characteristic of hypnosis (Edmonston, 1977), and use of the term relaxation would seem to avoid the demand characteristics of the term hypnosis.

Loftus (1980) presents data indicating that the altered states of consciousness engendered by alcohol and marijuana affect short term and long term memory as defined and measured by the serial position effects on lists of words presented to subjects under the different conditions. Results indicated alcohol and marijuana ingestion to be generally detrimental to the formation of new memories. If relaxation and or hypnosis could be shown to have similiar detrimental effects these states could be dismissed as an undesirable supplement to the lecture method of instruction.

Of the factors known to affect the serial position curve under free recall conditions the imagery evoking characteristics of the stimulus items employed has been shown to be of definite importance (Paivio, 1968). Whether relaxation states impede or facilitate the memory of high or low imagery evoking words differentially has not been determined. Words evoking a high degree of imagery are generally recalled with higher frequencies at all serial positions than are words evoking lower amounts of imagery. Given the amount of abstraction present in most college classroom lectures, could a relaxed state of concentration conceivably result in facilitated memory for abstract, low imagery words and concepts?

The typical undergraduate classroom situation can be viewed as consisting of a minimum of two phases. The first phase consists of the incorporation of the material to be learned, or at least some aspects of it, into memory. The second phase, depending on the type of information, is an integration-synthesis process that occurs more or less immediately or at some later point in time. If the initial incorporation into memory phase can logically be considered to precede and be

prerequisite to the integration-synthesis phase, then it would seem proper to initially investigate the relationship between various states of consciousness and memory processes. Does a systematic relationship exist between the learner's state of awareness and his ability to commit information to memory and access that information upon demand? Given that the lecture method, in one form or another, is apt to remain one of the economically feasible modes of instruction, are there quickly and easily inductable alterations in consciousness under which the learning process might be facilitated? If the state of the learner differentially affects the learning process, does the relative concreteness of the material make a difference? Do progressively deeper levels of relaxation facilitate memory? Finally, are various levels of relaxation related to systematic variation in the serial position curves of the recalled lists?

Although the effects of relaxation and hypnosis on free recall learning are reported in the literature most have used highly selected groups of subjects when groups were used at all. Few, if any, report using intact classroom groups. The effects of imagery on free recall have been well documented, however, its possible interaction with states of relaxation remains unclear. Likewise, the effects of drug induced alterations of consciousness on memory utilizing the serial position curve as an instrument of comparison have been reported while such comparisons on the effects of relaxation and hypnosis are absent. Clarification of the effects of these factors and their possible interaction would seem a useful addition to the literature of learning under altered states of consciousness as well as having important implications for education.

### Statement of the Problem

The general problem examined in this investigation was the relationship between various states of verbally induced relaxation and the immediate recall and delayed recognition of different levels of noun imagery presented in lists to intact groups in a classroom atmosphere. Specifically, (1) does the level of relaxation (normal awake, relaxed, or deeply relaxed) differentially affect the mean number of words subjects are able to recall immediately, (2) does the level of relaxation differentially affect the mean number of words subjects are able to recognize under delayed recognition conditions, (3) does the level of relaxation differentially affect the serial position curve of lists recalled immediately, (4) does the level of relaxation differentially affect the serial position curve of lists under delayed recognition conditions, (5) does the level of imagery (high or low) differentially affect the immediate recall of the stimulus items, and, (6) does the level of imagery differentially affect the delayed recognition of the stimulus items?

The present study is designed to clarify the relationships of the above factors to learning in a classroom situation using intact groups.

### Research Questions

The specific questions asked in this study are:

Research Question One: Does the presentation of instructions designed to induce relaxation and deep relaxation affect the acquisition and immediate recall of a list of unrelated nouns as compared to acquisition and immediate recall in the normal awake state as measured by the mean number of nouns recalled under each condition?

Research Question Two: Does the presentation of instructions designed to induce relaxation and deep relaxation affect the acquisition and delayed recognition of a list of unrelated nouns as compared to acquisition and delayed recognition in the normal awake state as measured by the mean number of words recognized under each condition?

Research Question Three: Are nouns which elicit high or low imagery remembered differentially as a function of the state under which acquisition took place as measured by the mean number of nouns of each type recalled in immediate recall under each condition?

Research Question Four: Are nouns which elicit high or low imagery remembered differentially as a function of the state under which acquisition took place as measured by the mean number of nouns of each type recognized under delayed recognition conditions?

Research Question Five: Do verbally induced conditions of relaxation or deep relaxation affect the serial position curve of nouns recalled immediately as compared to the curve obtained under the normal awake condition?

Research Question Six: Do verbally induced conditions of relaxation or deep relaxation differentially affect the serial position curve of lists of nouns recognized under the delayed recognition condition as compared to the curve obtained under the normal awake condition?

## CHAPTER II

### REVIEW OF THE LITERATURE

#### Relaxation and Hypnosis

Relaxation has of late been associated with a wide variety of phenomena that may or may not be related to any great extent. Benson (1975) advocates the learning of relaxation and the ability to elicit the relaxation response at will for its own inherent benefits as well as identifying it as being virtually synonymous with the meditative state. Although not going so far as to say that relaxation is the same as meditation, Carrington (1978) does discuss the many similarities between the two, concluding that meditation often includes, among other things, relaxation. Relaxation has long been recognized as one of the essential characteristics of hypnosis. In a rather extensive review of the pertinent literature, Edmonston, (1977) suggests that every major researcher in the area has at one time or another acknowledged the primary role of relaxation in hypnotic phenomena. A great deal of controversy has revolved around whether hypnosis is a qualitatively and or in fact quantitatively different state from the one recognized as the waking state. Hilgard (1965), among others has maintained that hypnosis is a state separate and apart from the waking state, being characterized by an ego dissociation. Barber (1979) has defined hypnosis not as a state or trance as has most commonly been

In addition, he found significant response suppression resulting from both direct hypnotic suggestion of relaxation and from non-hypnotic relaxation training procedures.

### Hypnosis and Verbal Learning

Hypermnnesia refers to unusually vivid or complete recall of events occurring in the past. Rosenthal (1944) found hypermnnesia for meaningful material and suggested that the reason for hypnotic hypermnnesia lies in the relaxed calm and freedom from anxiety that characterizes the hypnotic state, and moreover, inferred that relaxation is the concept that effectively ties together the enhanced memory capabilities of subjects in free association, the hypnagogic state, and hypnosis.

Claims that hypnosis enhances memory capability have not gone unchallenged. Such claims of memory enhancement have usually originated in the clinical use of hypnosis and clinicians using hypnosis in therapeutic settings defend its ability to facilitate their client's remembering previously forgotten or repressed material (Dhanens and Lundy, 1975). Controlled experimental analysis, however, has usually failed to substantially support claims of enhanced memory or motor performance abilities, more often generating inconclusive, contradictory, and confounded results. Barber and Calverley (1966) conclude following an extensive review of the literature of learning under hypnosis that hypnosis has never been shown to improve recall in a well controlled study. The effects of hypnosis on fine and gross motor skills has similiarily resulted in rather consistant findings of no difference between training under hypnosis and normal awake practice of equal amounts (Arnold, 1971). Cooper and London (1973), investigating the

done during this century, but rather, as a task-motivated condition of relaxation wherein the subject is asked to imagine, and does some of the things he is asked to do. Barber and Parker (1964) have been highly critical of most definitions of hypnosis because of their circular nature. A person responds to suggestions because he is hypnotized at the same time a person is considered hypnotized because he responds to suggestions (Treloar, 1967). Because of this, Barber (1979) has operationally defined a hypnotized subject as one who has been exposed to a hypnotic induction procedure. Much of the controversy seems to revolve around semantics. Barber's definition would seem to be the more parsimonious of those available, and, his non-state theorizing would seem to be supported by research that indicates that a person need not be hypnotized in order for the phenomena usually associated with hypnosis to become manifest (Barber and Parker, 1964). Barber and others have consistently found task-motivating instructions to be as effective as hypnotic suggestion in eliciting behaviors usually identified with hypnosis.

Edmonston (1977) advances the thesis that relaxation is the major condition associated with hypnosis and that relaxation is simply hypnosis without the connotations and demand characteristics usually associated with the term hypnosis being in operation. Reyher and Wilson (1973) found indirect hypnotic induction by progressive relaxation as effective as direct, formal hypnotic induction. Paul (1969) reports that in investigating the two major methods employed in systematic desensitization, relaxation and hypnosis, no differences between direct hypnotic suggestion procedures and relaxation training procedures were found in reducing response systems under direct voluntary control.



effects of hypnosis on delayed recall, likewise found that hypnosis did not affect the memory process. These experimental findings tend to violate not only the clinician's experience, but also, many people's intuitive guess as to what should happen. Regardless of whether hypnosis is relaxation or some other unique state, it is often conceived as resulting in a focused, concentrated condition. If a subject can concentrate more easily and more readily, and tends to do what is suggested, then why can't memory be consistently enhanced? Why has it often resulted in an inhibition of learning?

Most of the work on the effects of hypnosis on memory and learning has utilized one form or another of verbal learning paradigm. Results have been contradictory to say the least. The variables involved in hypnotizing a subject, exposing him to the material to be learned, then asking for recall performance, proved to be far more numerous than initially supposed. There were so many unspecified variables operating that successful replication has been almost non-existent. Some of the variables have been separated out and systematically studied over the years.

One of the first major variables to be regarded as obviously having a differential effect was the type of material the subject was required to learn. Wells (1924) found evidence for the enhanced recall of the detail of recently perceived stimuli. White, Fox, and Harris (1940) reported no gain in recall for nonsense material in the hypnotic state, but did report gains of about fifty three percent for recall of meaningful verbal material in the hypnotic state. Rosenthal (1944) also found enhanced memory for meaningful material in the form of poetry, but, not for nonsense material. Later, hypnosis was found to

have an inhibiting effect on the paired-associate learning of nonsense syllables (Harley and Harley, 1968). On the converse side, Swiercinsky and Coe (1970) found no difference in the recall of meaningful material between acquisition under hypnosis, task-motivation, and a no special instructions control group, while Pascal (1949) found evidence that the degree of relaxation was positively related to the number of nonsense syllables recalled.

#### Imagery and Verbal Learning

When paired-associate and free recall for word tasks have been employed with normal awake subjects results have been found to vary tremendously dependant on the imagery evoking qualities of the words and nonsense syllables used. Paivio (1965) found noun-adjective pairs more easily learned when concrete, high imagery evoking nouns were used than when abstract, low imagery evoking nouns were employed. High imagery nouns were demonstrated to take a significantly shorter time to form an image to (Paivio, 1966), and the contribution of imagery was shown not to be restricted to associative learning, but, was also operative in free recall as well (Paivio, 1967). The meaningfulness of nouns, defined in terms of the number of verbal associations that were made to them, was demonstrated to have no positive effect in paired-associated learning when the imagery evoking quality of the nouns were controlled (Paivio, Smythe, and Yuille, 1968).

#### Hypnotic Induction Variation

It eventually became apparent that the type material to be learned was not the only important determinant of the effects of hypnosis on

learning. Rather, several other variables were almost always hopelessly confounded in the previous research. Oetting (1964) noted that most commonly used hypnotic induction procedures repetitiously included statements and suggestions to the effect that the subject was lead to feel tired, sleepy, drowsy, and deeply asleep, a state generally not thought to be conducive to applying all one's effort to anything. With suggestions of alertness, Liebert, Rubin, and Hilgard (1965) found hypnosis to result in enhanced paired-associate learning recall over that found using a standard hypnosis induction procedure employing suggestions of drowsiness, sleep, and tiredness. That there might be more than a single type of hypnosis became a seriously considered question. Wells (1924), White (1937), and later Kratochvil (1970), among others, attempted to differentiate between waking hypnosis and sleep hypnosis. Sleep hypnosis was considered as traditional hypnosis wherein the hypnotized subject gives the behavioral impression of being asleep, while waking hypnosis was considered a form of hypnosis in which sleep like behaviors are absent, however, the subject remains susceptible to hypnotic suggestion. Other factors involved the suggestions themselves, whether or not suggestions for enhanced recall were given (Rosenthal, 1944) and (White, Fox, and Harris, 1940). Such factors as the tone of the voice used in the induction procedures as well as the rate of the induction procedure were suspected of having differential effects whereupon Barber (1966) suggested the use of tape recorded hypnotic inductions to keep it as bias free as possible.

#### Hypnotic Susceptibility of the General Population

Much of the work in hypnosis research has been directed toward the

determination of the characteristics of the "good" hypnotic subject. A "good" hypnotic subject is one who claims to experience and gives overt behavioral evidence of experiencing hypnotic suggestions as real. If hypnosis or states of relaxation are to have much utility in the education of groups, the questions pertaining to the characteristics of the responsive subject and the proportion of the population susceptible would seem of some importance.

With the use of standard hypnotic induction procedures, hypnotic susceptibility is generally assumed to be normally distributed throughout the population with approximately ten percent of the population being extremely good subjects and approximately ten percent of the population falling into the extremely poor subject category at the other tail of the distribution (Barber, 1979). From a clinical viewpoint, however, it should be noted that Erikson (1977) has argued that virtually one hundred percent of the population is hypnotizable using one induction procedure or another. In an attempt to determine how "good" subjects differ from "poor" subjects and to maximize possible differential effects, if in fact they exist, a large number of studies have used suggestibility scales of one form or another to classify subjects according to hypnotic suggestibility. Mixed and contradictory results have again been the rule rather than the exception. Contrary to popular belief, hypnotic susceptibility has repeatedly been shown not to be related to major personality variables as they are generally discussed. Schulman and London (1963) found that hypnotic susceptibility did not influence the learning of poems or nonsense syllables, nor, did the application of hypnosis have an effect. Several factors have been advanced to help account for the observed

individual differences in hypnotic susceptibility. Pelletier and Peper (1977) discuss the role of the Chutzpah factor, the ability to transcend fear and enter into the unknown as being an important factor. Some individuals, for whatever reason, can "turn loose" of their grasp on reality more readily than others. Related to the Chutzpah factor is an openness to absorbing and self altering experiences, called absorption, and identified by Tellegen and Atkinson (1974) as a trait consistently related to hypnotizability. Absorption is defined as episodes of "total" attention that fully engages one's representational (perceptual, enactive, imaginative, and ideational) resources. Hoen (1978) investigated the effects of hypnotizability and the subjects ability to visualize on paired-associate learning, concluding that neither hypnotizability nor visualizing ability had any significant effect, although, the imagery and concreteness of the words to be learned did demonstrate an effect. Wilson and Barber (1978) suggest that active imagination is an important if not the defining aspect of hypnosis and a relatively good measure of hypnotic susceptibility.

In its direct application to practical education, hypnosis and procedures resembling hypnosis have demonstrated mixed results. Probably the most intensive effort to apply hypnotic techniques to practical education has been associated with a system of instruction called Suggestology (Schuster, Benitz-Borden, and Gritton, 1976). Its adherents have made positive claims for the technique, among which is the vastly accelerated rate of acquisition of foreign languages. Loznov, the founder and popularizer of Suggestology has claimed that Suggestology and hypnosis are not the same thing. This has recently been questioned (Stanton, 1978). In a comparison of the methods used in

Suggestology and hypnotherapy, the author concludes that it is so difficult to differentiate between the two procedures that for all purposes they are the same thing, to which two different labels refer. Again, the contradictions present themselves. The proponents of Suggestology refer to a group of studies claiming to enhance learning and memory, while comparisons of Suggestology and hypnosis conclude that they are the same thing, and a whole literature of the effects of hypnosis on verbal learning tends to indicate that hypnosis has little if any effect, and sometimes an inhibitory effect. Criticism can be made of much of the reported Suggestology work. It has characteristically used groups of extremely small size, reports using one or two subjects not being uncommon, with virtually no control groups used, and often reported in anecdotal fashion.

The debate is similiarly carried over into the effect of hypnotic time distortion suggestions, a technique often reported in Suggestology. Krauss, Katzell, and Krauss (1974) report hypnotic time distortion to be a major variable affecting the learning and subsequent recall of words. Johnson (1976) challenges their conclusion and in running a study employing a different type of control group receiving task motivating instructions found that the number of words learned was purely a function of the amount of time spent studying them, hypnotic time distortion suggestions having no effect.

#### Serial Position Effects

The term serial position effect refers to the probability of an item being recalled after the presentation of a list of stimulus items as a function of its position within the list. Items presented early

in the list and those occurring at the end of the list tend to be recalled with a much higher frequency than those stimulus items in the middle. The enhanced recall of the first items is called the primacy effect while the enhanced recall of those items at the end of the list is referred to as the recency effect. The serial position effect has received widespread documentation and has served as a test of memory rather than a test of associative ability since at least 1894 (Kausler, 1974). The reliably obtained serial position curve has been used repeatedly as evidence that two memory systems, short and long term memory, are operating (Hall, 1971). Short term memory held to be responsible for the recency effect and long term memory for the enhanced recall for material presented at the first of the list, or the primacy effect. Recently, the serial position effect has been used to investigate the effects of some drug induced altered states of consciousness on long and short term memory. Loftus (1980) reviews the literature involving alcohol and marijuana and concludes that both drugs impair the subjects ability to form new memories. While no studies examining the effect of relaxation or hypnosis were found in the literature, the method and rationale would seem both applicable and appropriate.

#### Summary

The above review of the literature indicates that investigation concerning learning under hypnosis has been characteristically inconclusive and contradictory. Some studies showed enhancement of acquisition and recall performance while others showed no change or relaxation and hypnosis to have detrimental effects. Most of the work has

been done utilizing highly selected subjects on the basis of suggestibility and subjects receiving individualized treatment. In addition, the review noted that relaxation and hypnosis are viewed by many as being synonymous and that the examination of the serial position curves obtained under each condition could be informative.

The current study differs from most cited in the literature in that it is intended to approximate the reality of a university undergraduate classroom through the use of intact classes receiving treatment as groups, verbally exposing subjects to information to be remembered, and then requiring immediate recall as well as delayed recognition. It also uses meaningful words rather than nonsense syllables, uses a within subjects design so that each subject and group can serve as its own control, and defines the context of the experiment as relaxation rather than hypnosis thereby avoiding the demand characteristics often associated with hypnosis.



## CHAPTER III

### METHOD

#### Subjects

Subjects for this study were eighty-four Northwestern Oklahoma State University students enrolled in undergraduate psychology courses. Six intact classes containing 27 to 45 students were randomly assigned to one of two levels of imagery treatment and repeated measures of recall performance were taken on each of three levels of relaxation. The experiment was conducted on three consecutive meetings of each class. Any subject missing one of those meetings was deleted from the experiment, hence, the subject n for each class was fourteen. No discernable pattern for subject attrition was noted, therefore, subject attrition was assumed to be random.

#### Experimental Design

The design employed for this study was a nested design with subjects nested in classes, and classes nested in levels of imagery treatment, with repeated measures on three levels of relaxation and is schematically illustrated in Appendix E.

#### Stimulus Materials

The stimulus materials consisted of a spirit duplicated booklet

of four pages given to each subject each of the three days the experiment was conducted (see Appendix C). On each day, the first page contained the instructions for that day, the second page consisted of information pertaining to each individual, name, date, course, course number, sex, social security number, time, and treatment condition, and the instructions in brief form which the subjects were asked to review after they had filled in the information at the top of the page. The third page contained double spaced blank lines numbered one to twenty. The fourth page contained three questions on which the subjects were asked to rate their motivation to participate in the experiment that day, the extent to which they were able to follow the instructions given, and their relative state of relaxation, on scales from one to ten. These questions were used for two purposes, the first of which was to have the subjects actively do something so that the experimenter might be assured that they were not writing additional words, and, because it was felt that these questions might yield some interesting information. The analysis of this data was not performed for the purposes of this study.

#### List Construction

Lists of nouns were constructed by selecting sixty high imagery words ranging in imagery value from 6.10 to 6.87 with a mean of 6.53 from a list of 925 nouns rated for imagery on a scale from one to seven by students as reported by Paivio (1968). The words and their imagery values were then written on slips of paper, folded, then randomly drawn to determine their placement in list one, two, or three, as well as their serial position within each list. The same procedure was

followed in the construction of the low imagery lists. The values of the low imagery nouns ranged from 1.93 to 3.97 with a mean value of 3.11. The range of values of the low imagery nouns used exceeded that of the high imagery nouns because of the much greater proportion of high imagery nouns in the list of 925 scaled nouns available. Unusual, emotionally charged, and extremely long or short nouns were not used in the selection. Nouns utilized ranged from three to twelve letters in length (see Appendix A). Lists were then randomly assigned to treatment condition, either normal awake, relaxation, or deep relaxation.

#### Instructions for Relaxation Condition

Instructions for the relaxation treatment condition were derived from a relaxation procedure used by Masters and Houston (1972) that precedes a guided fantasy exercise. This procedure was modified slightly for the purpose of this study (see Appendix B).

#### Instructions for Deep Relaxation

The instructions for the deep relaxation condition were the same as those used for the relaxation condition with the addition of a modified version of Barber's (1979) hypnotic induction procedure (see Appendix B).

#### Delayed Recognition Measurement

In order to derive a measurement of the number of words that could be recalled from each treatment condition, following a one week delay, all six lists (120 nouns) were combined into one alphabetically arranged list to which 120 other nouns were interspersed. The result was an

alphabetically arranged list of 240 nouns which was given each subject (see Appendix C). Each subject was instructed to circle all the words he or she could recall as having been presented in the lists the previous week. The reader should note that at no time were subjects informed that they would be asked to try to remember the words at some future time.

### List Presentation

Lists of twenty nouns each were read orally via cassette tape at the rate of approximately two and a half seconds per word. Subjects were informed via the instructions that the words would be presented at the rate of about one word per three seconds.

### Apparatus

A Califone Cassette Recorder, model 3530 was used to both record the instructions and lists, and to present the treatments to classes. The cassette recorder was connected to a speaker system in the classroom by which the content was delivered to classes over two large ceiling speakers.

### Data Collection

Data were collected through group administration of lists and instructions. Classes were randomly assigned to imagery condition, either high or low. High and low imagery nouns were randomly assigned to smaller twenty noun lists, and lists were then randomly assigned to treatment condition. Order of treatment presentation was not randomly assigned as the three conditions of normal awake or control, relaxation,

and deep relaxation are naturally ordered. It would not seem possible for a subject to arrive at a deeply relaxed state without first having proceeded through some intermediate relaxed state. Similarly, after having experienced a deeply relaxed state the effect of relaxation could be expected to more closely resemble that of a deeply relaxed state rather than that of some intermediate state.

On the first day of the experiment the normal awake or control condition was conducted. The experimenter entered each classroom, explained that he was doing a study on memory and needed the class's help in collecting the necessary data. After clarification of any questions, and explanation that results of the study would be made available to them, twenty-two booklets were randomly distributed to students in each class. Subjects were informed that their participation was voluntary and that should they desire not to take part that they should simply return the booklet to the experimenter when it was handed to them. None refused to participate. Subjects were then asked to read along with the experimenter as the instructions were read aloud. Instructions were presented as follows:

Hello, my name is Keith Sawyer, and I need your help in collecting some data for use in a study concerning memory. Actually, I'm looking at how the type of memory processes that take place in a college classroom might be facilitated or adversely affected.

To gather the necessary data I'll need your assistance for a few minutes at the beginning of the next few meetings of this class. During those few minutes, I'll ask you to listen to a list of words, write down as many as you can recall afterwards, and have you answer 3 questions about your experience.

QUESTIONS SO FAR ?????

#### INSTRUCTIONS

Here's what I'd like you to do. In a couple of

minutes I will turn on a tape recorder and you will hear a list of 20 words at a rate of about 1 word per 3 seconds. It will take approximately 1 minute to listen to all 20 words. Listen to the list carefully, and when the list is over, the tape will instruct you to turn to the 3rd page of the booklet and write down as many as you can recall in any order you can remember them. Please use the top sheets as a cover sheet as I need to know how many words you as an individual recalled. You will have 3 minutes to write down all the words you can remember, at the end of which the tape will instruct you to turn to the 4th page of the booklet and answer the 3 questions listed there. DO SO IMMEDIATELY! Finish the word you may be writing and turn to the 4th page. On the 4th page are 3 questions that ask you to rate various aspects of your experience of this experiment on scales from 1 to 10. Answer the questions as truthfully and honestly as you can by circling one of the numbers along the scale.

#### QUESTIONS ?????

Following the clarification of any questions that arose, the subjects were then asked to turn to page two of the booklet and fill in the information requested, review the instructions in brief, then wait for the tape to begin. The tape was started and the subjects were informed via the tape that in ten seconds the list of words would begin. Following the presentation of the list of words, the subjects were instructed to turn to page three of the booklet and write down as many of the words as they could recall in any order they could remember them. They were allowed three minutes to do so, at the end of which they were instructed to turn to the fourth page of the booklet and answer the questions there.

On the second day, the procedures were the same except that different instructions were used in the introduction of that days experimental trial as follows:

Today you will hear a different list of words, but, before you listen to the words I'd like to see if you can become more relaxed than you presently are. In a moment

I will turn on the tape recorder and there will be some instructions I'd like you to follow as best you can. This will last for some 5 or 6 minutes and the tape will tell you when the list is about to begin.

Turn to page 2, fill in the information, review the brief instructions, then wait for the tape to begin.

Following the subjects review of the brief instructions the tape was begun. This time preceding the list of words was a set of instructions designed to help the students relax. The tape asked them to assume a comfortable position at their desk, then proceeded to have them attempt to relax various parts of their body and finally, to engage in forty-five seconds of deep breathing. The tape again informed them that the list of words would begin in ten seconds. Following the presentation of the list subjects were asked to remain as relaxed as possible, turn to page three and recall the words as before. At the end of three minutes they were told that time was up and to turn to the fourth page and answer the questions there.

On the third day a similiar procedure was utilized again except that different introductory statements were used as follows:

Once again, you will hear yet a different list of words. This time, however, I'd like to see if you can become even more relaxed than you were the last time, achieving a deeper state of relaxation. Listen to the tape and follow along with the instructions as best you can.

Turn to page 2, fill in the information, review the brief instructions, then wait for the tape to begin.

The tape was begun and the same relaxation instructions as the previous day were given the subjects with the addition of a hypnotic induction procedure which repeatedly told subjects they could feel very comfortable, calm, at ease, and even more relaxed than they presently were (see Appendix B). Subjects were continually asked

to go deeper and deeper into a relaxed state, and were asked to imagine themselves floating on a cloud, and walking down a stairway with each step representing a deeper level of relaxation. Finally, the subjects were asked to imagine their minds as open, alert, relaxed, sharp, clear, focused, and confident.

Subjects were then informed that in ten seconds the list of words would begin. Following the presentation of the lists the subjects were told that the list was over, to remain as relaxed as possible, and to turn to page three of the booklet, and recall the words as before. At the end of three minutes, the subjects were told to turn to page four and answer the questions there.

#### Hypotheses

The following hypotheses were derived from the problem statement and were tested in this study.

Hypothesis One: The mean number of nouns recalled under the normal awake condition will not differ from the mean number of nouns recalled under the relaxation condition or under the deep relaxation condition collapsed across levels of imagery.

Hypothesis Two: When categorized as to acquisition treatment the mean number of nouns recognized from the normal awake presentation will not differ from the mean number recognized from the relaxed presentation or the deep relaxation presentation collapsed across levels of imagery.

Hypothesis Three: The mean number of high imagery nouns recalled will not differ from the mean number of low imagery nouns recalled collapsed across all levels of relaxation treatment.



Hypothesis Four: The mean number of high imagery nouns recognized after a delay of one week will not differ from the mean number of low imagery nouns recognized collapsed across all levels of relaxation treatment.

Hypothesis Five: The mean percentage of subjects recalling nouns at each serial position will not differ as a function of level of relaxation treatment collapsed across levels of imagery.

Hypothesis Six: The mean percentage of subjects recognizing nouns at each serial position will not differ as a function of level of relaxation treatment collapsed across levels of imagery.

#### Analysis of the Data

Hypotheses one through four were investigated using a three-way nested repeated measures analysis of variance (imagery by classroom by level of relaxation) with repeated measures on the level of relaxation treatment. See Appendix E for a schematic diagram of the experimental design. Separate analyses were conducted on immediate recall and delayed recognition performance. There were two levels of imagery (high and low), six intact classroom groups with fourteen subjects per group, and three levels of relaxation treatment (normal awake, relaxation, and deep relaxation). While the study began with twenty-two randomly selected subjects per class, the data from any subject not present for all three experimental sessions was deleted from the study. The number of subjects per class present for all three experimental sessions ranged from fourteen to sixteen. Data from those classes with more than fourteen subjects were randomly deleted using previously assigned subject numbers. The final result was six

classroom groups with fourteen subjects each. Data resulting from the investigation of hypotheses one through four were analyzed using SAS (1979), the minimum requirement for significance being set at  $p < .05$ . Post hoc tests of specific comparisons were carried out on sources of significant variation using a family wise error rate of  $p < .05$ .

Hypotheses five and six were examined using a series of one by three Chi-Squares, one at each of the twenty serial positions for immediate recall and delayed recognition. The ranking of level of relaxation at each serial position was also examined using a three by three Chi-Square analysis. All Chi-Square analyses were carried out at the .05 alpha level.

## CHAPTER IV

### RESULTS

The primary focus of this study was to examine the effects of three levels of learner relaxation on the acquisition and subsequent memory of lists of unrelated nouns under immediate recall and delayed recognition conditions. Secondly, the effects of noun imagery was examined in its relationship to recall and recognition as well as its possible interaction with the three levels of relaxation used in this study. In addition, serial position effect changes as a function of level of relaxation and conditions of immediate recall and delayed recognition were investigated. The results provide information regarding the utility of placing groups of learners in a relaxed state in an attempt to enhance learning. Directions for future research were also indicated.

The experiment was designed to be analyzed using a three-way analysis of variance to examine the effects of imagery on level of relaxation with intact classroom groups being the third factor which was nested in imagery classification. Immediate recall and delayed recognition dependant variable measures were subjected to separate analysis. Hartley's F-Maximum Test for Homogeneity of Variances (Bruning and Kentz, 1977) was performed using twelve df and twelve k on both immediate recall and delayed recognition data, indicating that the variances involved were homogenous at the .05 alpha level. Fol-

lowing confirmation that the analysis of variance assumptions of homogeneity of variance was met, the data associated with hypotheses one through four were analyzed using Statistical Analysis Systems (SAS, 1979). Results of this analysis on immediate recall data is presented in Table I. No significant differences were found involving intact classroom groups, therefore, that factor will be collapsed in the presentation of the results of this study.

TABLE I  
SUMMARY TABLE FOR THE ANALYSIS OF VARIANCE:  
IMMEDIATE RECALL

Source	SS	df	MS	F
<u>Between Subjects</u>	1600.413	83		
A (imagery)	680.143	1	680.143	91.900*
B (A) (classes)	29.603	4	7.401	0.648
S (B) (subjects)	890.667	78	11.419	
<u>Within Subjects</u>	599.333	168		
C (level of relaxation)	4.675	2	2.337	0.678
A x C	40.452	2	20.226	9.760*
C x B (A)	16.587	8	2.073	0.600
C x S (B)	537.619	156	3.446	
TOTAL	2199.746	251		

\*p < .05

As can be seen in Table I, the main effect of imagery was significant in the immediate recall condition, however, direct interpretation

of the main effect is obscured by the level of imagery by level of relaxation interaction. A simple effects breakdown was therefore performed, the results of which are presented in Table II.

TABLE II  
SUMMARY TABLE FOR THE ANALYSIS OF VARIANCE:  
SIMPLE EFFECTS BREAKDOWN:  
IMMEDIATE RECALL

Source	SS	df	MS	F
A	680.143	1	680.143	191.852*
A at C <sub>1</sub>	268.011	1	268.011	75.599*
A at C <sub>2</sub>	98.583	1	98.583	27.808*
A at C <sub>3</sub>	336.000	1	336.000	94.778*
C	4.675	2	2.337	0.659
C at A <sub>1</sub>	12.253	2	6.126	1.728
C at A <sub>2</sub>	32.873	2	16.436	4.636*
A x C	40.452	2	20.226	5.705*
Within Cell	567.222	160	3.545	
TOTAL	2040.212	172		

\*p < .05

Results indicate that high imagery nouns were recalled significantly better at every level of relaxation. Table III lists the means used in the comparison and Figure 1 illustrates the relationships between level of imagery and level of relaxation.

TABLE III

MEAN WORDS RECALLED AS A FUNCTION OF LEVEL  
OF IMAGERY AND LEVEL OF RELAXATION:  
IMMEDIATE RECALL

Level of Relaxation	IMAGERY		MEAN
	HIGH	LOW	
NORMAL AWAKE	10.928	7.238	9.083
RELAXATION	10.500	8.333	9.412
DEEP RELAXATION	11.261	7.262	9.262
MEAN	10.897	7.611	

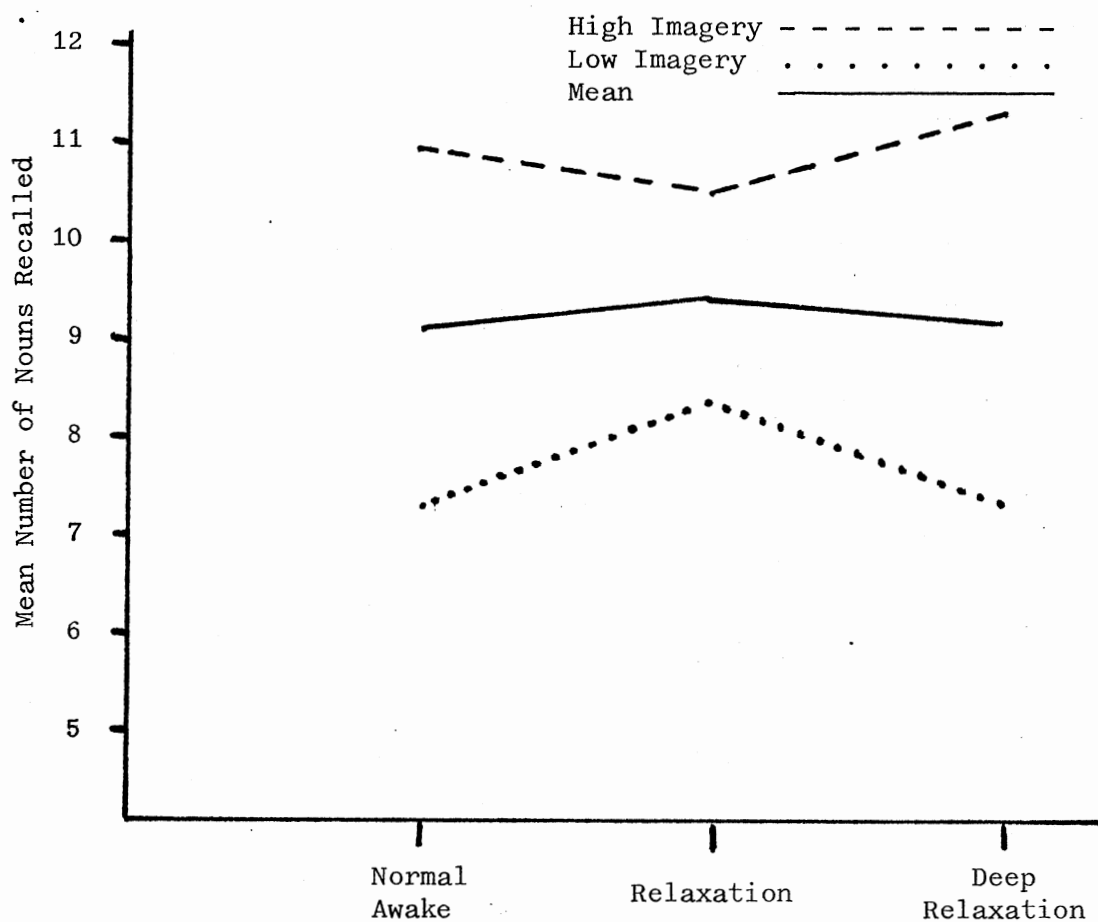


Figure 1. Mean Number of Nouns Recalled as a Function of  
Level of Imagery and Level of Relaxation:  
Immediate Recall

It can be determined by examination of Table II that there were no significant differences found for the effect of level of relaxation on the immediate recall of high imagery nouns while there was a significant difference for the effect of level of relaxation on the recall of low imagery nouns. A post-hoc specific comparisons analysis was performed using the Tukey HSD Test for Pairwise Comparisons of Means (Bruning and Kentz, 1977), the results of which are presented in Table IV.

TABLE IV  
 TUKEY'S HSD TEST FOR PAIRWISE COMPARISONS OF MEANS  
 ON C AT A<sub>1</sub> SIMPLE EFFECTS BREAKDOWN:  
 IMMEDIATE RECALL

Means	$\bar{X}_5$	$\bar{X}_6$	$\bar{X}_4$
	8.333	7.262	7.238
$\bar{X}_5$ 8.333	- - -	1.071*	1.095*
$\bar{X}_6$ 7.262	- - -	- - -	- - -
$\bar{X}_4$ 7.238	- - -	- - -	- - -

\*p < .05

Examination of Table IV indicates that while the mean number of low imagery nouns recalled under the normal awake and deep relaxation conditions did not differ from each other at the .05 level of significance, the mean number of low imagery nouns recalled under the relax-

ation condition significantly differed from both. This relationship can be seen in Figure 1. Strength of association analysis (Linton and Gallo, 1975) on significant effects yielded an  $\eta^2$  for the imagery factor of 0.30919 and an  $\eta^2$  of 0.018389 for the level of imagery by level of relaxation interaction. These strength of association measures indicate that about thirty-one percent of the variance in mean number of nouns recalled was a function of imagery and that about two percent of the variation was due to the level of imagery by level of relaxation interaction.

Results of the analysis of variance on the delayed recognition data are presented in Table V.

TABLE V  
SUMMARY TABLE FOR THE ANALYSIS OF VARIANCE:  
DELAYED RECOGNITION

Source	SS	df	MS	F
<u>Between Subjects</u>	2409.662	83		
A (imagery)	147.813	1	147.813	2.57
B (A) (classes)	230.111	4	57.528	2.21
S (B) (subjects)	2031.738	78	26.048	
<u>Within Subjects</u>	1019.999	168		
C (level of relaxation)	63.151	2	31.576	5.58*
A x C	11.103	2	5.552	0.71
C x B (A)	62.555	8	7.819	1.38
C x S (B)	883.190	156	5.661	
TOTAL	3429.661	251		

\* $p < .05$



Once again, no significant differences were found involving the intact classroom groups, therefore, that factor will be collapsed in the presentation of the results of the delayed recognition data.

As can be seen in Table V the main effect of level of relaxation was significant. Table VI reports the means of the imagery by relaxation cells and Table VII presents the results of the Tukey's HSD Test for Pairwise Comparisons of Means (Bruning and Kentz, 1977).

TABLE VI  
MEAN WORDS RECALLED AS A FUNCTION OF LEVEL  
OF IMAGERY AND LEVEL OF RELAXATION:  
DELAYED RECOGNITION

LEVEL OF RELAXATION	IMAGERY		MEAN
	HIGH	LOW	
NORMAL AWAKE	10.048	8.452	9.250
RELAXATION	10.524	9.476	10.000
DEEP RELAXATION	9.428	7.762	8.595
MEAN	10.000	8.563	

Results indicate that the mean number of nouns recognized that were presented under the normal awake condition did not differ significantly from the mean number of nouns recognized which were presented under the relaxation condition, nor did the mean number of nouns recognized under the normal awake condition differ significantly from the mean number recognized under the deep relaxation condition. The

mean number of nouns recognized which were presented under the relaxation condition did differ significantly from the mean number recognized under the deep relaxation condition. This relationship is illustrated in Figure 2 and indicates that the relaxation condition enhanced the delayed recognition of nouns presented under that treatment over that of the deep relaxation condition.

TABLE VII  
TUKEY'S HSD TEST FOR PAIRWISE COMPARISONS  
ON THE MAIN EFFECT OF C:  
DELAYED RECOGNITION

Means	$\bar{X}_2$	$\bar{X}_1$	$\bar{X}_3$
	10.000	9.250	8.595
$\bar{X}_2$ 10.000	---	0.750	1.405*
$\bar{X}_1$ 9.250	---	---	0.655
$\bar{X}_3$ 8.595	---	---	---

\* $p < .05$

Strength of association analysis (Linton and Gallo, 1975) on the effect of level of relaxation yielded an  $\eta^2$  of 0.01841, indicating that less than two percent of the variation in mean number of nouns recognized was due to the level of relaxation treatment.

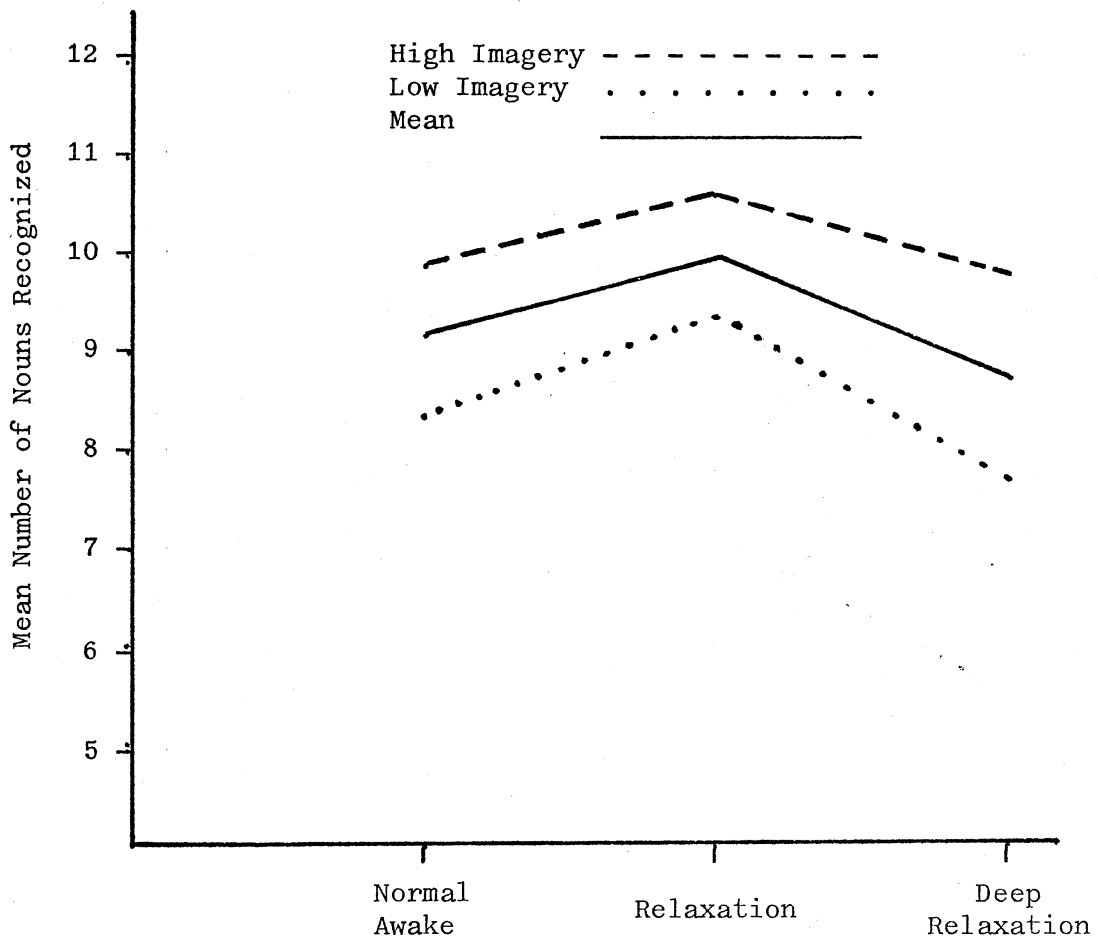


Figure 2. Mean Number of Nouns Recognized as a Function of Level of Imagery and Level of Relaxation: Delayed Recognition

Since the number of words recognized on the delayed recognition task could have been a direct function of the total number of words circled, (had a subject circled all 240 nouns he would have by definition circled all sixty of the nouns presented to him during treatment), a one-way analysis of variance on extra-list intrusions was performed. The results of this analysis are presented in Table VIII.

TABLE VIII  
 SUMMARY TABLE FOR THE ANALYSIS OF VARIANCE  
 EXTRA-LIST INTRUSIONS IN  
 DELAYED RECOGNITION

Source	SS	df	MS	F
A (imagery)	112.012	1	112.012	0.510
B (A) (classes)	880.952	4	220.238	6.170*
S (B) (subjects)	2785.929	78		
TOTAL	3778.893	83		

\* $p < .05$

Table IX shows the results of Tukey's HSD Test for Pairwise Comparisons of Means performed on the significant effect of intact classroom groups noted above.

Results indicate that the intact groups differed significantly on the number of extra-list intrusions errors committed in the delayed recognition condition. Intra and extra-list intrusions occurred so infrequently during immediate recall that they were not subjected to analysis. Group six differed significantly from all the other groups while no differences were found among groups one through five.

Little convention was found to be established in the literature as to acceptable methods of serial position curve comparisons other than visual examination of graphically plotted data. In order to determine if level of relaxation had a systematic effect on the serial position curves generated by each condition, the percentage of nouns recalled or recognized under each condition at each of the twenty serial positions

were compared using a series of one by three Chi-Squares. Figure 3 illustrates the serial position curves obtained from each level of relaxation while Table X reports the results of this analysis for immediate recall.

TABLE IX

TUKEY'S HSD TEST FOR PAIRWISE COMPARISONS  
ON THE EFFECT OF B(A) ON EXTRA-LIST  
INTRUSIONS: DELAYED RECOGNITION

Means	$\bar{X}_6$	$\bar{X}_3$	$\bar{X}_1$	$\bar{X}_4$	$\bar{X}_2$	$\bar{X}_5$
	15.428	8.000	6.7857	6.4285	5.6428	4.8571
$\bar{X}_6$ 15.428	- - -	7.43*	8.64*	8.99*	9.78*	10.57*
$\bar{X}_3$ 8.000	- - -	- - -	1.21	1.57	2.36	3.14
$\bar{X}_1$ 6.7857	- - -	- - -	- - -	0.36	1.14	1.93
$\bar{X}_4$ 6.4285	- - -	- - -	- - -	- - -	0.78	1.57
$\bar{X}_2$ 5.6428	- - -	- - -	- - -	- - -	- - -	0.78
$\bar{X}_5$ 4.8571	- - -	- - -	- - -	- - -	- - -	- - -

\*p < .05

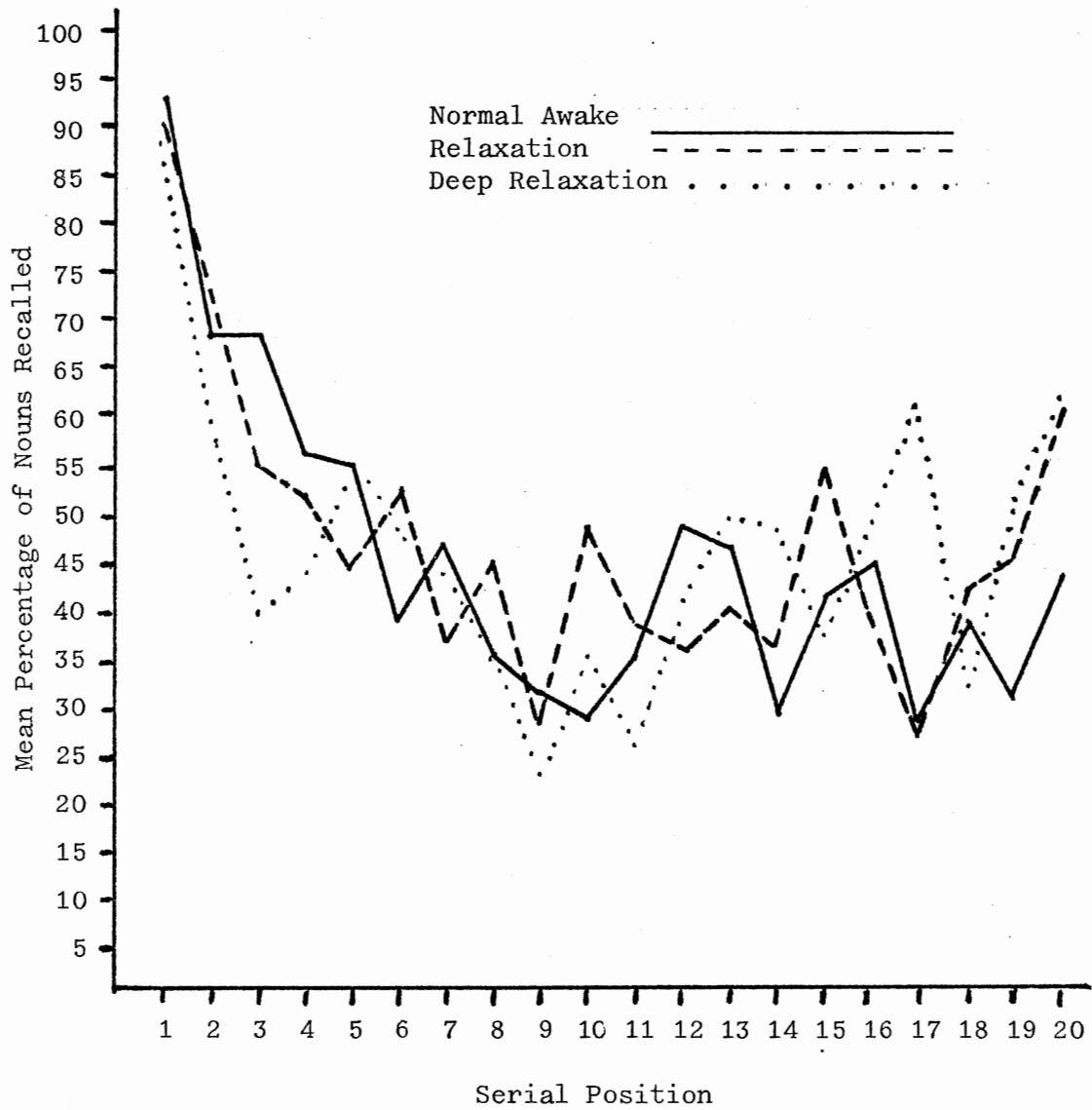


Figure 3. Normal Awake, Relaxation, and Deep Relaxation  
Serial Position Curves: Immediate Recall

TABLE X  
 CHI-SQUARES OF SERIAL POSITION CURVES:  
 IMMEDIATE RECALL

Serial Position	$f_{o_{NA}}$	$f_{o_{R}}$	$f_{o_{DR}}$	$f_e$	Chi Squares
1	94	91	88	91.0	0.1978
2	68	70	61	66.3	0.6737
3	68	55	39	54.0	7.8148*
4	56	52	44	50.7	1.4727
5	55	44	55	51.3	1.5725
6	38	53	47	46.0	2.4782
7	47	36	44	42.3	1.5288
8	35	45	35	38.3	1.7407
9	32	27	23	27.3	1.4897
10	29	48	35	37.3	5.0581
11	35	37	26	32.7	2.1000
12	49	36	41	42.0	2.0476
13	47	40	49	45.3	0.3022
14	29	36	48	37.7	4.8984
15	42	55	33	43.3	5.6505
16	45	39	52	45.3	1.8690
17	29	27	62	39.3	19.6608*
18	38	42	32	37.3	1.3584
19	31	46	51	42.6	5.0863
20	44	62	63	56.3	4.0616

\* $p < .05$  (tabled value = 5.9914)

Table X indicates that the three levels of relaxation differed significantly at serial positions three and seventeen. This being the case, each of the levels of relaxation were rank ordered from highest (1), to lowest (3), at each serial position and the resulting ranks

in each level of relaxation were subjected to a three by three Chi-Square analysis. Table XI reports the observed and expected rank frequencies.

TABLE XI  
CHI-SQUARE ANALYSIS OF LEVEL OF RELAXATION RANKS:  
IMMEDIATE RECALL

Rank	1		2		3		MT
	$f_o$	$f_e$	$f_o$	$f_e$	$f_o$	$f_e$	
Normal Awake	6	(6.10)	7	(5.78)	5	(6.10)	18
Relaxation	7	(6.78)	7	(6.42)	6	(6.78)	20
Deep Relaxation	6	(6.10)	4	(5.78)	8	(6.10)	18
Margin Totals	19		18		19		56

This analysis yielded a Chi-Square value of 5.1749, which when compared to the tabled value of 9.4877 ( $p < .05$ ) indicated that no level of relaxation resulted in the occurrence of a given rank above what could be expected by chance.

Figure 4 illustrates the serial position curves of each level of relaxation while table XII reports the results of the repeated Chi-Square analysis at each serial position on the delayed recognition data.



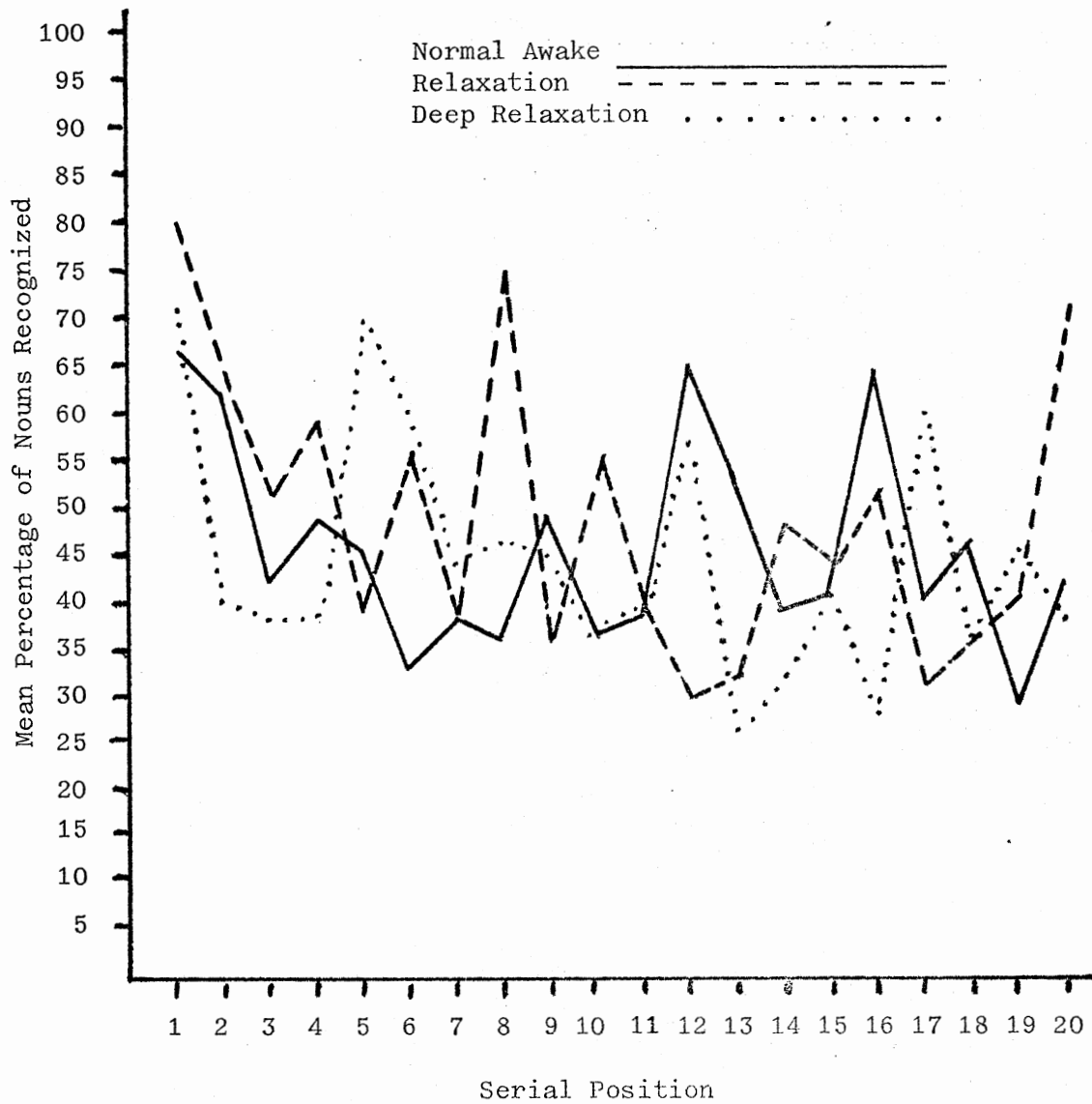


Figure 4. Normal Awake, Relaxation, and Deep Relaxation  
Serial Position Curves: Delayed Recognition

TABLE XII  
 CHI-SQUARES OF SERIAL POSITION CURVES:  
 DELAYED RECOGNITION

Serial Position	$f_{oNA}$	$f_{oR}$	$f_{oDR}$	$f_e$	Chi Squares
1	66.5	81.0	70.5	72.7	1.5429
2	63.0	65.5	40.5	56.3	6.7348*
3	42.0	52.5	38.0	44.2	2.5377
4	49.0	59.5	38.0	48.8	4.7370
5	45.0	39.5	69.0	51.2	9.6126*
6	33.5	56.0	59.5	49.7	8.0114*
7	38.0	38.5	44.0	40.2	0.5514
8	36.0	75.0	46.5	52.5	15.5142*
9	49.0	50.0	45.0	48.0	0.2916
10	37.0	55.5	33.5	42.0	6.6547*
11	38.0	41.5	39.0	39.5	0.1645
12	65.5	30.0	57.0	50.8	13.5269*
13	53.5	33.5	26.5	37.8	10.3880*
14	38.0	48.0	33.0	39.7	2.9387
15	40.5	44.0	40.5	41.7	0.0345
16	65.5	53.5	28.5	49.2	14.4851*
17	39.5	30.5	60.5	43.5	10.8965*
18	46.0	36.5	35.5	39.3	1.7091
19	28.5	40.5	45.0	38.0	3.8289
20	43.0	71.0	38.0	50.7	12.4786*

\* $p < .05$  (tabled value = 5.9914)

Table XII indicates that the three levels of relaxation differed significantly at ten serial positions. The data from these ten positions were rank ordered as before and subjected to a three by three Chi-Square analysis. Observed and expected frequencies are listed in Table XIII.

TABLE XIII

CHI-SQUARE RANK ANALYSIS OF TEN SIGNIFICANT  
SERIAL POSITIONS: DELAYED RECOGNITION

Rank	1		2		3		MT
	$f_o$	$f_e$	$f_o$	$f_e$	$f_o$	$f_e$	
Normal Awake	3	(3.33)	5	(3.33)	2	(3.33)	10
Relaxation	4	(3.33)	3	(3.33)	3	(3.33)	10
Deep Relaxation	3	(3.33)	2	(3.33)	5	(3.33)	10
Margin Totals	10		10		10		30

This analysis yielded a Chi-Square of 3.5342 which when compared to the tabled value of 9.48773 ( $p < .05$ ), indicated that ranks occurring by level of relaxation did not exceed what could be expected by chance. The ranks from all twenty positions were then subjected to the same three by three Chi-Square analysis, the observed and expected frequencies of which are shown in Table XIV.

TABLE XIV

CHI-SQUARE ANALYSIS OF LEVEL OF RELAXATION RANKS:  
DELAYED RECOGNITION

Rank	1		2		3		MT
	$f_o$	$f_e$	$f_o$	$f_e$	$f_o$	$f_e$	
Normal Awake	5	(6.55)	8	(6.22)	6	(6.22)	19
Relaxation	10	(6.89)	6	(6.55)	4	(6.22)	20
Deep Relaxation	5	(6.55)	5	(6.22)	9	(6.55)	19
Margin Totals	20		19		19		58

This analysis yielded a Chi-Square of 5.1749, which when compared with the tabled value of 9.4877 ( $p < .05$ ), indicated that no single rank was associated with any given level of relaxation at more than a chance level of probability.

#### Tests of Research Questions

The research questions will be discussed in terms of the statistical results of the data.

Research Question One: Does the presentation of instructions designed to induce relaxation and deep relaxation affect the acquisition and immediate recall of a list of unrelated nouns as compared to acquisition and immediate recall in the normal awake state as measured by the mean number of nouns recalled under each condition? Referencing Table I, the effect of level of relaxation was not significant ( $F_{2,156} = 0.678$ ), therefore, hypothesis one cannot be rejected indicating that levels of relaxation had no effect on immediate recall. Thus, Research Question One was answered in the negative.

Research Question Two: Does the presentation of instructions designed to induce relaxation and deep relaxation affect the acquisition and delayed recognition of a list of unrelated nouns as compared to acquisition and delayed recognition in the normal awake state as measured by the mean number of words recalled under each condition? Referencing Table V, the effect of level of relaxation on delayed recognition was significant ( $F_{2,156} = 5.58$ ), therefore, hypothesis two can be rejected indicating that the level of relaxation differentially affected the delayed recognition of nouns. However, Research Question Two must still be answered in the negative as relaxation recognition

did not differ significantly from the normal awake condition recognition. Further analysis demonstrated that recognition of nouns presented under the relaxation treatment was superior to the deep relaxation treatment, but, not significantly different from the normal awake condition.

Research Question Three: Are nouns which elicit high or low imagery remembered differentially as a function of the state under which acquisition took place as measured by the mean number of nouns of each type recalled in immediate recall under each condition? Referencing Table I, the effect of level of imagery on immediate recall was significant ( $F_{1,78} = 91.9$ ), therefore, hypothesis three can be rejected, indicating that the level of imagery differentially affected the immediate recall of nouns. This relationship is illustrated in Figure 1. An interaction between level of imagery and level of relaxation was significant ( $F_{2,8} = 9.76$ ), indicating that high and low imagery nouns were not recalled equally well at all levels of relaxation. Subsequent analysis indicated that high imagery nouns were recalled equally well at all levels of relaxation while low imagery nouns were recalled significantly better under the relaxation treatment than under either the normal awake or deep relaxation condition. Thus, Research Question Three was answered in the affirmative.

Research Question Four: Are nouns which elicit high or low imagery remembered differentially as a function of the state under which acquisition took place as measured by the mean number or nouns of each type recognized under delayed recognition conditions? Referencing Table V, the effect of level of imagery was not significant ( $F_{1,78} = 2.57$ ), therefore, hypothesis four cannot be rejected indicating that

level of imagery had no effect on the delayed recognition task. Thus, Research Question Four was answered in the negative.

Research Question Five: Do verbally induced conditions of relaxation or deep relaxation affect the serial position curve of nouns recalled immediately as compared to the curve obtained under the normal awake state condition? Referencing Table X, it can be seen that level of relaxation did not produce any systematic difference in serial position. Referencing Table XI, it can also be seen that the ranks produced by level of relaxation resulted in no consistent differences. Hypothesis five, therefore, cannot be rejected, thus, Research Question Five was answered in the negative.

Research Question Six: Do verbally induced conditions of relaxation or deep relaxation differentially affect the serial position curve of lists of nouns recognized under the delayed recognition condition as compared to the curve obtained under the normal awake condition? Referencing Table XII, it can be seen that the level of relaxation produced significant differences at ten of the serial positions. Referencing Table XIII, it can be seen that analysis of these ten serial positions indicated that no level of relaxation was associated with any given rank above chance probability. Referencing Table XIV, it can also be seen that an analysis of all serial positions in delayed recognition likewise yielded no differences above that expected by chance. Therefore, hypothesis six cannot be rejected. Thus, Research Question Six was answered in the negative.

## CHAPTER V

### DISCUSSION

#### Summary of the Investigation

The present study examined the effects of level of relaxation and level of stimulus noun imagery on the immediate recall and delayed recognition of unrelated nouns. Also, the effects of level of relaxation on the serial position effect was investigated. The study was undertaken to determine whether or not placing intact classroom groups in a state of relaxation would facilitate the recall and/or recognition of information presented under lecture like conditions. The effects of relaxation on free recall tasks is not currently available in the literature other than those studies done within the context of hypnosis. Additionally, most of the studies reported have used highly suggestible subjects and, therefore, are not generalizable to the general college student population. Further, most of the studies have either used paired associate learning tasks, or, have not controlled for the effects of imagery. This study was performed in order to provide information not currently found in the research literature related to the above statements.

Data were obtained from eighty-four Northwestern Oklahoma State University undergraduate students enrolled in psychology courses. Analysis of variance and chi-square procedures were used to analyze the data, test the hypotheses, and answer the research questions.

Within the limits and results of the present study, the following conclusions are suggested:

1. Groups of students remember lists of unrelated high imagery nouns no better after having been exposed to relaxation and deep relaxation instructions than those not exposed to such instructions.
2. Relaxation slightly enhances the recall of unrelated low imagery nouns over deep relaxation or no instructions for relaxation.
3. Relaxation enhances delayed recognition of unrelated nouns over delayed recognition of unrelated nouns presented under a condition of deep relaxation, but, not over delayed recognition of nouns presented in the normal awake state.
4. High imagery nouns are remembered under immediate recall conditions much better than are low imagery nouns.
5. Low imagery nouns are remembered under delayed recognition conditions just as well as high imagery nouns.
6. Conditions of relaxation and deep relaxation do not produce consistent deviations in the serial position effect when compared to a serial position curve generated by a normal awake state under either immediate recall or delayed recognition conditions.

As might be expected from the research literature, the level of imagery had a major effect on the immediate recall of nouns. Referencing Table V, it is interesting to note that this effect was not carried over into the delayed recognition task, ( $F_{1,78} = 2.57, p > .05$ ). This lack of carry over is illustrated in Figure 5.



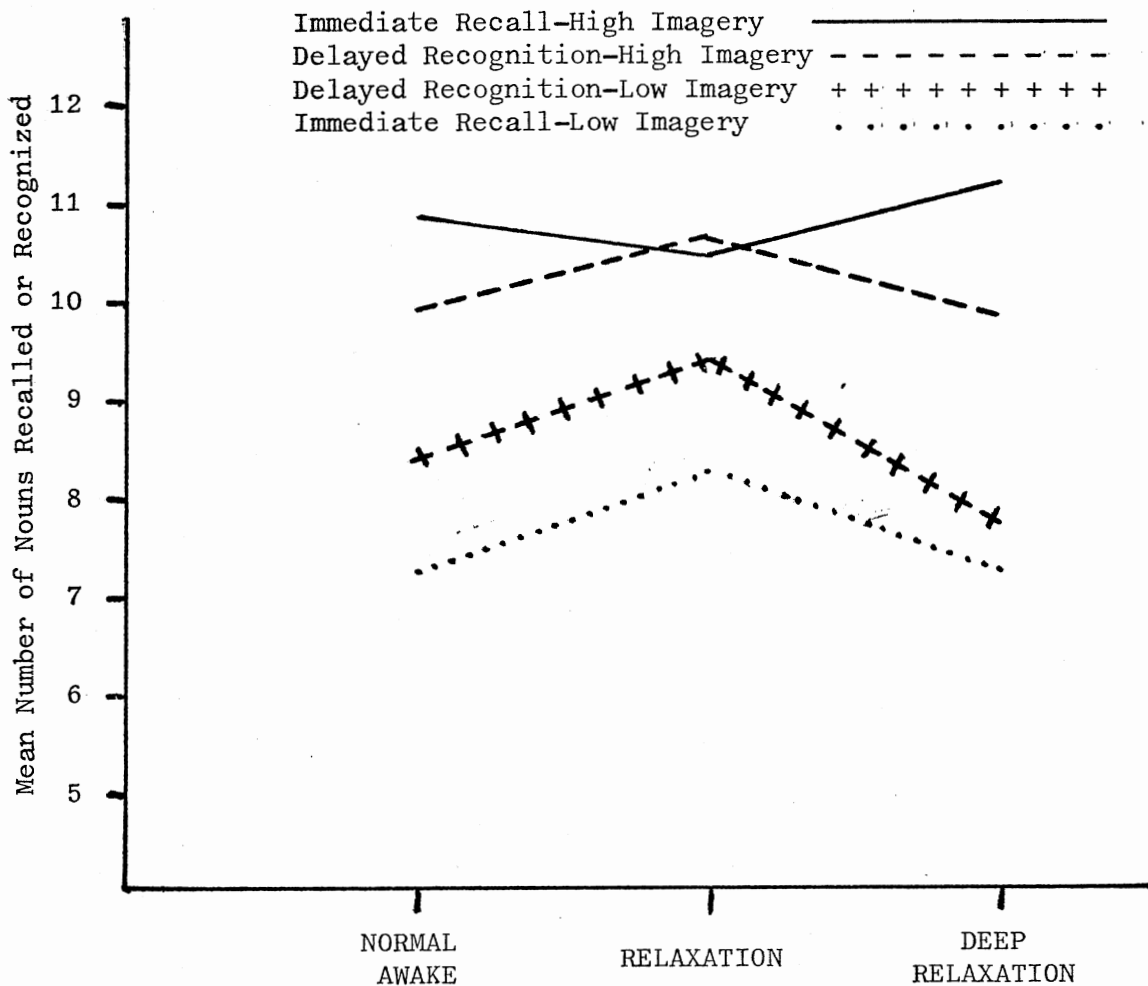


Figure 5. Mean Number of Words Recalled as a Function of Condition of Recall-Recognition, Imagery, and Level of Relaxation

As can be seen in Figure 5, immediate recall and delayed recognition of high imagery nouns remained fairly constant from one task to the other while delayed recognition for low imagery nouns increased considerably over immediate recall for those same nouns. The author has no adequate explanation for why this occurred. It is difficult to say why low imagery nouns were recognized following a delay of one week this much better than were high imagery nouns. As can be seen in Figure 6, this relationship is also clearly reflected in the serial

position curves. The primary increase in mean number of low imagery words recognized during delayed recognition occurred in the middle of the lists rather than at the ends where the primacy and recency effects normally operate.

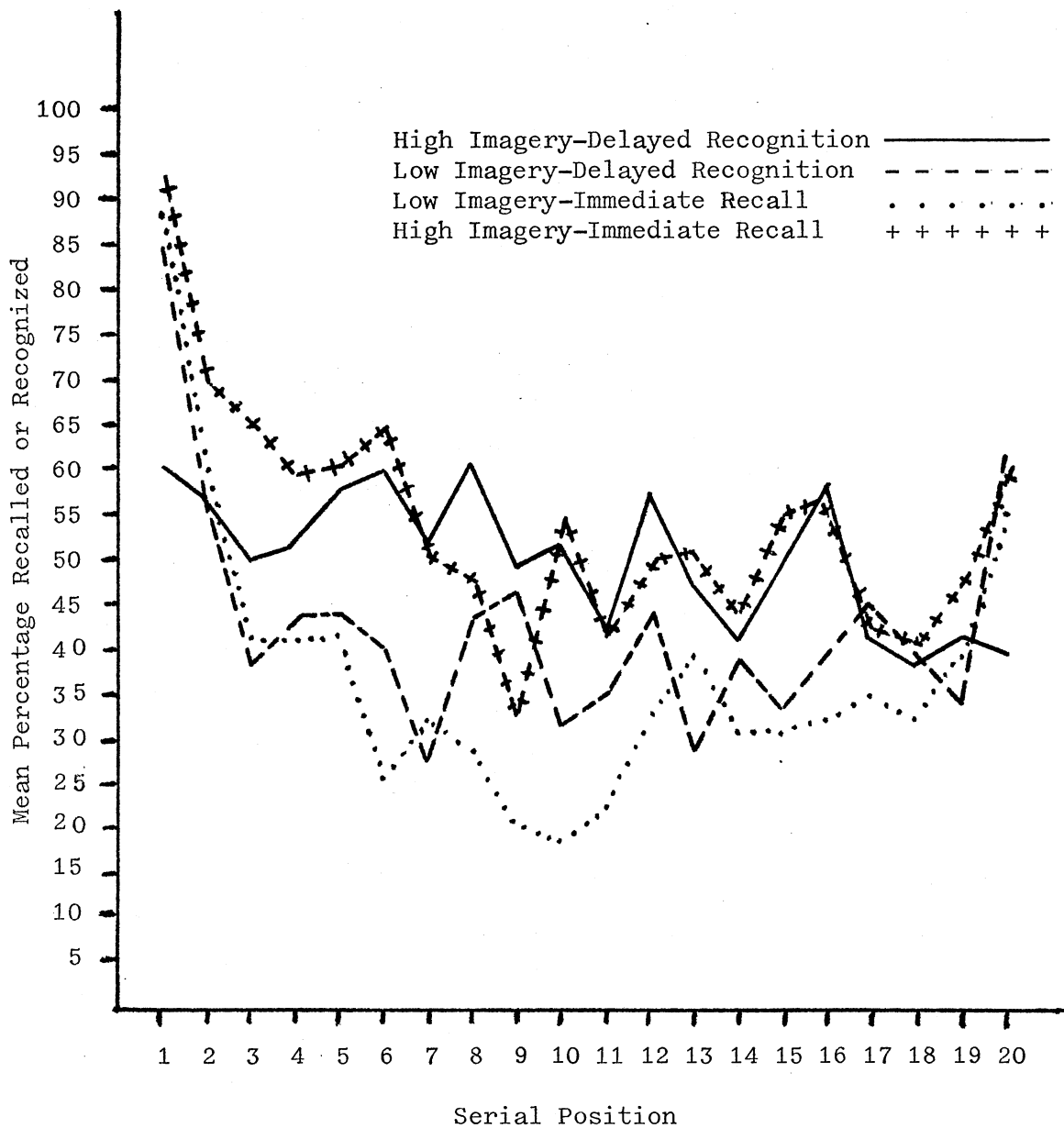


Figure 6. Serial Position Curves of Imagery and Recall Tasks

It is also interesting that the relaxation condition inhibited the immediate recall of high imagery nouns while enhancing the delayed recognition of those same nouns as well as enhancing recall and recognition of low imagery nouns. Again the author has no readily available explanation as to why this occurred.

Overall, as might be expected, delayed recognition was superior to immediate recall. While this held true under both the normal awake and relaxation conditions, the relationship was reversed under the deep relaxation condition as shown in Figure 7.

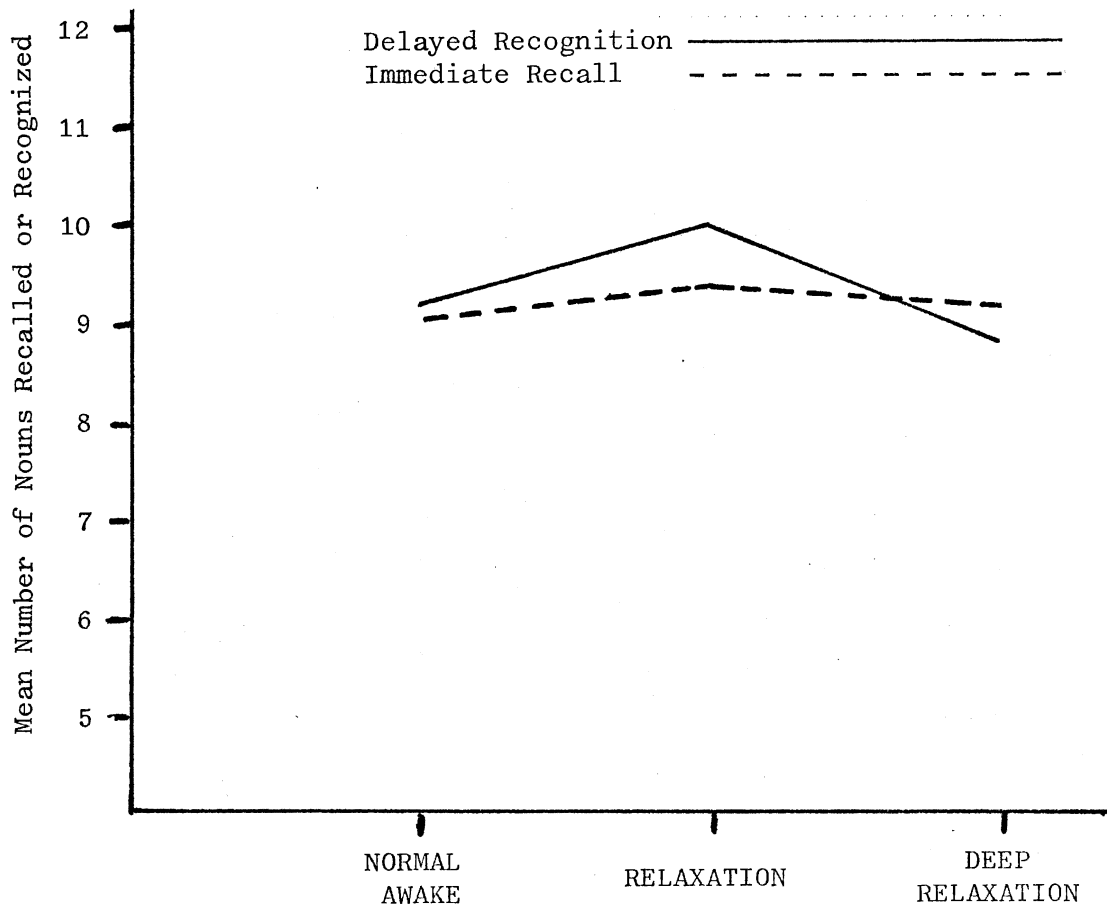


Figure 7. Overall Immediate Recall and Delayed Recognition as a Function of Level of Relaxation

It is generally accepted that recognition test performance is better than performance relying on total recall. This did not, however, occur under the deep relaxation condition.

This study has not provided strong evidence for the position that inducing relaxation in groups of students enhances the amount of material learned. This result may be due to the fact that states of relaxation have no effect on memory processes, or, that the result was an artifact of the lack of randomized order or presentation of the levels of relaxation treatment. Two possible effects of the non-randomized order of treatment presentation seem possible. First of all, it might be suspected that with subsequent list presentation a practice effect would be in operation wherein subjects would become more proficient at learning lists of nouns regardless of treatment unless the treatment had an inhibiting or interfering effect. The second possibility is that subsequent list presentation progressively created additional interference, thereby inhibiting the recall of later lists. The two proposed effects are juxtaposed and if operating would lead to opposite results. Although it is perhaps difficult to entirely rule out a practice effect, the data from this experiment does not suggest that it occurred in any linear fashion. Rather, the progressive interference effect seems more likely as numerous studies reviewed by Underwood (1957) indicate that the percentage of recall decreases systematically as a function of the number of lists previously learned. Underwood found that the most dramatic decreases were found in the first lists learned, the effect leveling off somewhat after the fifth list. Underwood interpreted this decreasing function of recall performance as evidence that a form of proactive interference

was taking place. In view of Underwood's findings it may be that the relaxation and deep relaxation conditions actually enhanced learning and memory, the enhancement effect being obscured by the increasing probability that interference would decrease the percentage of nouns recalled or recognized as subsequent lists were presented.

#### Recommendations

Due to the limitations and findings of this study, the following recommendations are made:

1. Future research in this area should include an additional control group receiving the same treatment repeatedly in order to determine an additional baseline against which the effect of level of relaxation treatment could be compared to separate the effects of treatment, practice, and interference from previously presented lists.

2. The effects of training should be investigated. It may well be that altered states involving relaxation actually could facilitate learning and memory if the subject could quickly and reliably attain the state. The procedure involved in this study was tantamount to inducing a novel state the subject may never have experienced previously. The result could have been that the subject was more engrossed in experiencing the state of relaxation rather than learning the material presented.

3. It would be desirable for the characteristics of responsive subjects to be investigated. A regression analysis on a number of factors including learning style, personality, intelligence, grade point average, and hypnotic susceptibility among others, would yield information as to the characteristics of subjects who experience

learning and memory facilitation.

4. Although the dependant variable measurement tasks used in this study were meant to approximate a classroom situation, (immediate recall to test how much of the information was incorporated into memory and delayed recognition to resemble an objective test over previously learned material), use of the same task under immediate and delayed conditions would lend itself to a more direct interpretation of the results.

5. It would also be desirable to examine the effects of altered states involving relaxation on the learning of regular classroom lecture content, recognizing the higher order memory processing that takes place outside a rote learning of lists of nouns.

6. It would seem fruitful to investigate the effects of various sets of verbal instructions involving relaxation as related to the physiological state produced and the performance under such states. Different suggestive instructions may possibly produce different states and subsequent performances.

7. The present study was concerned with presentation of material under different levels of relaxation and requested recall and recognition under the normal awake state. Recall and recognition may well be enhanced by the subject attempting to recall or recognize the material under the same state as it was acquired.

8. Although the effects of time distorting suggestions have not as yet been conclusively established, this type suggestion, if effective, could be of tremendous value. Additional research is called for.

### Limitations of the Study

Several factors limit the generalizability of the results of this study. The findings are generalizable only to the extent that the assumptions underlying the study are met. Additionally, the results are generalizable only to other similar intact student groups consisting of undergraduate psychology classrooms. Further, the results could be generalized only to the extent that similar induction procedures were followed using similar materials.

### Ethics

A serious concern involves the use of human subjects and their manipulation in psychological research. In this study subjects participated voluntarily, no inducements being employed other than their being told that they were helping the experimenter collect some data. The subjects were informed that the study involved the effects of various levels of relaxation on memory. Subjects were offered several opportunities, and in fact were encouraged, to ask questions. When questions arose, they were answered as truthfully and straightforwardly as possible. The slight deception involved in the experiment was one of controversial semantics. Whereas the subjects were informed that the study involved relaxation, and many of them readily voiced the belief that they had in fact become more relaxed than they could recall ever having been, the deep relaxation instructions were a combination of two hypnotic induction procedures with the word relaxation emphasized rather than hypnosis. The experimenter was fully aware that at least some of the subjects would achieve one level or

another of what has been called a trance state. Barber (1979) has characterized hypnosis as a task-motivated state of relaxation in which the person is asked to imagine and do certain things. Coe and Ryken (1979) evaluated the risks to human subjects when involved in hypnosis research and concluded that hypnosis presents no more risk to human subjects nor is it any more bothersome than any of a number of other standard experimental procedures commonly used.

Finally, the proposed research was approved by the appropriate individuals in the school administration as well as by the individual instructors of the classes used in this study.

#### Implications for Education

With the rapidly expanding volume of information which must be learned for adequate operation in modern society, it is imperative that new methods and techniques of learning and teaching be explored. The investigation of the application of altered states of consciousness to education represents but one avenue of research that holds promise and should be continued.



#### A SELECTED BIBLIOGRAPHY

- Arnold, J. Effects of hypnosis on the learning of two selected motor skills. The Research Quarterly, 1971, 42, 1-6.
- Barber, T.X., and Parker, P.D. Hypnosis and task-motivating instructions and learning performance. Journal of Abnormal and Social Psychology, 1964, 69, 499-504.
- Barber, T.X., and Calverly, D.S. Effects on recall of hypnotic induction, motivational suggestion, and suggested regression: a methodological and experimental analysis. Journal of Abnormal Psychology, 1966, 71, 169-180.
- Barber, T.X. Personal Communication. Dallas, Texas, March 3, 1979.
- Barber, T.X. Relaxation instructions and hypnotic induction. A hand-out given at a professional seminar on hypnosis and psychosomatics, March 3, 1979.
- Benson, H. The relaxation response. New York: Avon Books, 1975.
- Broadbent, D.E. Perception and communication. New York: Pergamon Press, 1958.
- Carrington, P. Freedom in meditation. Garden City, New York: Anchor Books, 1978.
- Coe, W.C., and Ryken, K. Hypnosis and risks to human subjects. American Psychologist, August, 1979, 34, 673-681.
- Cole, L. A history of education from Socrates to Montessori. New York: Rinehart and Company, 1950.
- Cooper, L., and London, P. Reactivation of memory by hypnosis and suggestion. The International Journal of Clinical and Experimental Hypnosis, 1973, 21, 312-323.
- Dhanens, T.P., and Lundy, R.M. Hypnotic and waking suggestions and recall. The International Journal of Clinical and Experimental Hypnosis, 1975, 23, 68-79.
- Dickens, C. Hard times. 1854. Found in Johnston, B. The Literature of Learning - A Teachers Anthology. New York: Holt, Rinehart, and Winston, Inc., 1971.

- Dorris, T. Personal Interview. Stillwater, Oklahoma, February 18, 1980.
- Eby, F., and Arrowood, C. The history and philosophy of education ancient and medieval. Englewood Cliffs, N.J.: Prentice-Hall Inc., 1940.
- Edmonston, W.E. Clinical and experimental trance: Unity through methodology. American Journal of Clinical Hypnosis, 1970, 13, 5-9.
- Edmonston, W.E. Neutral hypnosis as relaxation. American Journal of Clinical Hypnosis, July, 1977, 20, 69-75.
- Erickson, M.H., and Goleman, D. Secrets of a modern mesmer. Psychology Today, July, 1977, 11, 62-66.
- Hall, J.F. Verbal learning and retention. New York: J.B. Lippincott Company. 1971.
- Harley, W.F. jr., and Harley, W.F. Sr. The effects of hypnosis on paired associate learning. Journal of Personality, September, 1968, 36, 331-340.
- Hilgard, E. Hypnotic susceptibility. New York: Harcourt, Brace & World, 1965.
- Hoen, P. Effects of hypnotizability and visualizing ability on imagery mediated learning. The International Journal of Clinical and Experimental Hypnosis, 1978, 26, 45-54.
- Houston, J. The psychenout program: an exploration into some human potentials. Journal of Creative Behavior, 1973, 7, 253-278.
- Huxley, A. Island. New York: Bantam Books, Inc., 1962.
- Johnston, R.F.Q. Hypnotic time distortion and the enhancement of learning: New data pertinent to the Krauss-Katzell-Krauss experiment. The American Journal of Clinical Hypnosis, October, 1976, 19, 98-101.
- Kausler, D.H. Psychology of verbal learning and memory. New York: Academic Press Inc., 1974.
- Kirk, R.E. Experimental design: procedures for the behavioral sciences. Belmont, California: Brooks/Cole, 1968.
- Kratochvil, S. Sleep hypnosis and waking hypnosis. The International Journal of Clinical and Experimental Hypnosis, 1970, 18, 25-40.
- Krauss, H., Krauss, B., and Katzell, R. Effects of hypnotic time distortion upon free-recall learning. Journal of Abnormal Psychology, 1974, 83, 140-144.

- Liebert, R.M., Rubin, N., and Hilgard, E.R. The effects of suggestions of alertness in hypnosis on paired-associate learning. Journal of Personality, 1965, 33, 605-612.
- Linton, M., and Gallo, P.S., Jr. The practical statistician: simplified handbook of statistics. Monterey, California: Brooks/Cole Publishing Company, 1975.
- Loftus, E. Alcohol, marijuana, and memory. Psychology Today, March, 1980, 13, 42-56, 92.
- Masters, R., and Houston, J. Mind games, the guide to inner space. New York: Dell Publishing Co., Inc., 1972.
- Oetting, E.R. Hypnosis and concentration in study. American Journal of Clinical Hypnosis, 1964, 7, 148-151.
- Paivio, A. Abstractness, imagery, and meaningfulness in paired-associate learning. Journal of Verbal Learning and Verbal Behavior, 1965, 4, 32-38.
- Paivio, A. Latency of verbal associations and imagery to noun stimuli as a function of abstractness and generality. Canadian Journal of Psychology, 1966, 20, 378-387.
- Paivio, A., Yuille, J., and Madigan, S. Concreteness, imagery, and meaningfulness values for 925 nouns. Journal of Experimental Psychology, January, 1968, 76, 1-25.
- Pascal, G.R. The effect of relaxation upon recall. American Journal of Psychology, 1949, 62, 33-47.
- Paul, G.L. Extraversion, emotionality, and physiological response to relaxation training and hypnotic suggestion. International Journal of Clinical and Experimental Hypnosis. 1969, 17, 89-98.
- Pelletier, K., and Peper, E. The chutzpah factor in altered states of consciousness. Journal of Humanistic Psychology, 1977, 17, 63-73.
- Reyher, J., and Wilson, J. The induction of hypnosis: indirect vs. direct methods and the role of anxiety. American Journal of Clinical Hypnosis, April, 1973, 15, 229-233.
- Rosenthal, B.G. Hypnotic recall of material learned under anxiety and non-anxiety producing conditions. Journal of Experimental Psychology, 1944, 34, 369-389.
- Schulman, R.E., and London, P. Hypnosis and verbal learning. Journal of Abnormal and Social Psychology, 1963, 67, 363-370.

- Schuster, D.H., Benitez-Borden, R., and Gritton, C.A. Suggestive, accelerative learning and teaching; a manual of classroom procedures based on the lozanov method. Des Moines, Iowa, 1976.
- Stanton, H.E. Suggestology or hypnosis: it's all in the label. Journal of Suggestive and Accelerative Learning and Teaching, 1978, 3, 248-252.
- Statistical Analysis Systems. Raleigh, North Carolina: SAS Institute, 1979.
- Swiercinsky, D., and Coe, W. Hypnosis, hypnotic responsiveness, and learning meaningful material. The International Journal of Clinical and Experimental Hypnosis, 1970, 18, 217-222.
- Tart, C. (Ed.). Altered states of consciousness. New York: John Wiley and Sons, Inc., 1969.
- Tellegen, A., and Atkinson, G. Openess to absorbing and self-altering experiences ("absorption"), a trait related to hypnotic susceptibility. Journal of Abnormal Psychology, 1974, 83, 268-277.
- Treloar, W.W. Review of recent research on hypnotic learning. Psychological Reports, 1967, 20, 723-732.
- Underwood, B.J. Interference and forgetting. Psychological Review, 1957, 64, 49-60.
- Wells, W.R. Experiments in waking hypnosis for instructional purposes Journal of Abnormal and Social Psychology, 1924, 18, 389-404.
- West, C., and Foster, S. The psychology of human learning and instruction in education. Belmont, California: Wadsworth Publishing Company, Inc., 1976.
- White, C. Personal Interview. Alva, Oklahoma, May 27, 1977.
- White, R.W., and Fox, G.F., and Harris, W.W. Hypnotic hypernesia for recently learned material. Journal of Abnormal and Social Psychology, 1940, 35, 88-103.
- Wilson, S.C., and Barber, T.X. The creative imagination scale as a measure of hypnotic responsiveness: application to experimental and clinical hypnosis. Hypnosis and Psychosomatics: a Collection of Reference Materials, San Francisco Proseminar Institute, 1978.

APPENDIX A

STIMULUS WORDS USED ALONG WITH IMAGERY,  
CONCRETENESS, AND MEANINGFULNESS  
VALUES

LIST I  
NORMAL AWAKE CONDITION  
HIGH IMAGERY

SERIAL POSITION	WORD	IMAGERY	CONCRETENESS	MEANINGFULNESS
1.	frog	6.73	6.96	6.56
2.	bird	6.67	6.96	7.88
3.	queen	6.57	6.38	7.36
4.	tree	6.77	7.00	6.79
5.	peach	6.60	6.80	6.84
6.	grass	6.63	6.96	7.54
7.	street	6.57	6.62	7.48
8.	chair	6.63	7.00	7.20
9.	arrow	6.57	7.00	6.80
10.	hammer	6.73	6.96	6.92
11.	whale	6.50	6.96	7.24
12.	icebox	6.17	6.90	6.28
13.	baby	6.70	6.90	7.01
14.	money	6.43	6.63	6.68
15.	pupil	6.37	6.63	6.24
16.	bottle	6.57	6.94	7.24
17.	oven	6.40	6.96	8.08
18.	snake	6.90	7.00	7.04
19.	judge	6.27	6.25	7.24
20.	stone	6.23	6.96	7.24
		$\bar{X} =$		
		6.55	6.84	7.08

LIST II  
RELAXATION CONDITION  
HIGH IMAGERY

SERIAL POSITION	WORD	IMAGERY	CONCRETENESS	MEANINGFULNESS
1.	church	6.63	6.59	7.52
2.	pencil	6.37	6.70	6.48
3.	doctor	6.40	6.62	7.32
4.	jelly	6.40	6.73	6.00
5.	railroad	6.27	6.76	6.60
6.	swamp	6.33	6.62	6.67
7.	mosquito	6.53	6.96	7.84
8.	infant	6.33	6.76	7.20
9.	policeman	6.70	6.69	6.96
10.	refrigerator	6.67	7.00	7.36
11.	ambulance	6.67	7.00	7.52
12.	shoes	6.63	7.00	7.52
13.	lemon	6.83	6.96	7.72
14.	valley	6.57	6.66	6.56
15.	girl	6.87	6.83	5.12
16.	apple	6.73	7.00	7.67
17.	piano	6.70	6.85	6.40
18.	engine	6.33	6.76	6.08
19.	volcano	6.63	6.83	7.60
20.	ankle	6.77	7.00	6.80
		$\bar{X} =$ 6.57	6.82	6.95

LIST III  
DEEP RELAXATION CONDITION  
HIGH IMAGERY

SERIAL POSITION	WORD	IMAGERY	CONCRETENESS	MEANINGFULNESS
1.	library	6.73	6.87	6.40
2.	blister	6.53	6.67	7.13
3.	flood	6.33	6.62	6.36
4.	missle	6.33	6.80	6.48
5.	insect	6.10	6.80	6.32
6.	butterfly	6.63	6.93	7.80
7.	kiss	6.80	6.13	6.68
8.	flower	6.57	6.96	7.13
9.	bagpipe	6.43	6.96	7.00
10.	corn	6.47	6.90	6.96
11.	umbrella	6.60	7.00	6.76
12.	doll	6.17	6.94	6.12
13.	wine	6.60	6.96	7.51
14.	house	6.67	6.93	6.83
15.	tobacco	6.27	6.87	7.84
16.	woman	6.70	6.63	6.40
17.	cradle	6.23	6.94	6.96
18.	toast	6.57	6.93	7.84
19.	scorpion	6.27	6.93	6.24
20.	wheat	6.40	7.00	7.96
		$\bar{X} =$		
		6.47	6.84	6.94



LIST IV  
NORMAL AWAKE CONDITION  
LOW IMAGERY

SERIAL POSITION	WORD	IMAGERY	CONCRETENESS	MEANINGFULNESS
1.	knowledge	2.97	1.56	6.36
2.	hatred	3.97	1.59	4.84
3.	instance	2.00	2.87	4.04
4.	length	3.73	3.75	5.84
5.	cost	3.57	3.11	6.24
6.	style	3.83	3.18	5.84
7.	law	3.73	3.23	6.32
8.	occasion	2.53	3.22	5.00
9.	gravity	3.60	2.56	6.24
10.	advice	3.13	2.08	5.39
11.	amount	2.73	3.62	5.81
12.	moment	2.50	2.52	4.38
13.	promotion	3.33	3.56	5.56
14.	substitute	3.13	4.56	4.48
15.	quantity	3.47	3.32	4.17
16.	fantasy	3.70	2.03	5.06
17.	confidence	3.40	1.52	4.17
18.	method	2.63	2.20	5.20
19.	miracle	3.33	2.25	5.60
20.	opinion	3.23	2.29	4.96
		$\bar{X} =$ 3.23	2.75	5.28

LIST V  
RELAXATION CONDITION  
LOW IMAGERY

SERIAL POSITION	WORD	IMAGERY	CONCRETENESS	MEANINGFULNESS
1.	economy	3.20	2.28	5.88
2.	boredom	3.83	1.94	4.63
3.	illusion	3.53	2.03	4.67
4.	memory	3.10	1.78	5.00
5.	thought	2.77	1.28	5.32
6.	freedom	3.83	1.98	6.36
7.	mood	3.67	1.52	5.36
8.	concept	1.93	1.97	3.76
9.	ability	2.67	2.03	5.60
10.	item	3.67	5.27	4.96
11.	nonsense	3.07	1.90	4.12
12.	hope	3.83	1.18	5.52
13.	soul	2.13	1.87	6.40
14.	event	2.90	3.72	5.04
15.	greed	3.53	1.73	5.52
16.	fact	2.20	3.31	4.29
17.	trouble	3.53	2.25	5.08
18.	truth	2.73	1.69	4.78
19.	spirit	3.43	1.86	5.72
20.	aptitude	2.60	1.62	5.25
		$\bar{X} =$ 3.11	2.16	5.16

LIST VI  
DEEP RELAXATION CONDITION  
LOW IMAGERY

SERIAL POSITION	WORD	IMAGERY	CONCRETENESS	MEANINGFULNESS
1.	attitude	2.77	1.83	5.60
2.	impulse	3.70	2.08	4.96
3.	effort	3.33	2.22	5.75
4.	crisis	3.43	2.81	5.44
5.	theory	2.57	1.90	5.88
6.	quality	3.10	2.13	5.52
7.	welfare	3.17	2.35	6.16
8.	idea	2.20	1.42	4.88
9.	honor	3.50	1.75	5.08
10.	majority	3.63	3.48	5.48
11.	excuse	2.77	3.05	4.04
12.	hypothesis	2.40	2.25	5.36
13.	hint	2.57	3.35	3.72
14.	hour	3.60	2.93	5.56
15.	duty	3.17	2.32	5.60
16.	mercy	3.40	1.59	5.20
17.	democracy	2.47	1.79	5.72
18.	belief	2.73	1.55	5.24
19.	unit	2.87	4.33	4.80
20.	chance	2.50	1.51	5.61
		$\bar{X} =$ 2.99	2.28	5.28

APPENDIX B

TAPED INSTRUCTIONS ADMINISTERED FOR CONTROL  
RELAXATION, AND DEEP RELAXATION  
CONDITIONS

## TAPED CONTROL CONDITION INSTRUCTIONS

Ten seconds from now, when I quit talking the list of words will begin.

[10 seconds]

Either:

LIST I

OR

LIST II

frog  
bird  
queen  
tree  
peach  
grass  
street  
chair  
arrow  
hammer  
whale  
icebox  
baby  
pupil  
money  
bottle  
oven  
snake  
judge  
stone

knowledge  
hatred  
instance  
length  
cost  
style  
law  
occasion  
gravity  
advice  
amount  
moment  
promotion  
quantity  
substitute  
fantasy  
confidence  
method  
miracle  
opinion

The list is over. Please turn to the third page of your booklet and list as many words as you can recall in any order. You will have three minutes to do so.

[3 minutes]

Time is up. Please turn to page four and answer the questions there. Thank you.

## TAPED RELAXATION CONDITION INSTRUCTIONS

Even after decades of study and research many of the memory processes remain elusive. One of the questions this study is designed to investigate is, how does relaxation affect memory? Does it help, or, interfere with memory? Today, you will be asked to listen to a different list of words, but, before the list of words is presented, I'd like to see if you can become a little more relaxed than you are now or were the other day. To do this, I'd like you to find a comfortable position at your desk. Make yourself very comfortable now..... relaxing just as fully as you can. And now..... listen closely and discover that you can relax still more. Relax your body a bit at a time..... beginning with the toes..... just let them go very limp and relaxed..... then the rest of the foot..... and the ankle..... feeling the ankle going limp and relaxed..... and that relaxation moving up through your body..... to the calves..... and the knees..... and on up to the thighs..... and just going very, very limp in your body..... as I describe the progression of this relaxation to you..... and now..... on up to the pelvic area..... relaxing..... becoming more and more relaxed..... and the abdomen now..... and on up to the chest..... going loose and limp all over..... the fingers..... the wrists..... the forearms..... the elbows..... upper arms..... and on up to the shoulders now..... feel the relaxation..... all the strain and tension draining out and away from the body..... so that the neck feels very loose and limp now..... and the jaw..... the lips..... the cheeks..... and the eyes..... right on up to the forehead..... and over the entire head now.....

The entirety of your body relaxed now..... and relaxing even more..... and more..... so that you are just as limp as an old rag doll appears to be..... and you really are that relaxed. As you listen now to what I have to say to you..... and you will want to listen extremely closely..... very, very closely please..... as you are listening just to me..... becoming aware of just what is said to you..... and of your response to what is being said to you..... and for a little while now..... with closed eyes..... and remaining relaxed..... breathing slowly and deeply..... focus your awareness on that breathing..... as you breathe in now..... and then breathing out..... in..... and out..... in..... and out..... and continue for a few seconds.

[45 seconds]

Let your eyes remain closed now..... be deeply relaxed..... and there is something of importance and value that I have to say to you now..... So concentrate just upon what I will say to you..... very fully concentrated on my words..... and on what you will experience when the words are spoken.

Ten seconds after I quit talking the list of words will begin. Remain as fully relaxed as you possibly can as you listen. I will tell you when the list is over and at that time, slowly open your eyes and while remaining fully relaxed turn to page three and write all the words you can recall from the list. The ten second pause will begin now. Use it to become even more relaxed.

[10 seconds]

Either

LIST II

LIST V

church  
pencil  
doctor  
jelly  
railroad  
swamp  
mosquito  
infant  
policeman  
refrigerator  
ambulance  
shoes  
lemon  
valley  
girl  
apple  
piano  
engine  
volcano  
ankle

or

economy  
boredom  
illusion  
memory  
thought  
freedom  
mood  
concept  
ability  
item  
nonsense  
hope  
soul  
event  
greed  
fact  
trouble  
truth  
spirit  
aptitude

The list is over. Slowly open your eyes while remaining as relaxed as possible, turn to page three, and begin writing.

[3 minutes]

Time is up. Please turn to page 4 and answer the questions there. Thank you.



## TAPED DEEP RELAXATION CONDITION INSTRUCTIONS

As I mentioned the other day, memory is still very much a mystery. Another of the questions that this study is looking at is, does the relative degree of relaxation have the same effect? As already mentioned in the instructions, you will basically be doing the same thing as before, except today, I'd like to see if you can become even more relaxed than you were before. To do this we'll again go through the body relaxation, but, in addition to that we'll see if you can get your mind to relax as well by having you use your imagination in the process.

Once again find a comfortable position at your desk..... and as you do so simply start to feel yourself relax as you did the last time. Listen closely now..... and relax even more. Relax your body a bit at a time..... beginning with the toes..... just let them go very limp and relaxed..... then the rest of the foot..... and the ankle..... feeling the ankle going limp and relaxed..... and that relaxation moving on up to the thighs..... and just going very, very limp in your body..... on up to the pelvic area..... relaxing..... becoming more and more relaxed..... and the abdomen now..... and on up to the chest..... going loose and limp all over..... the fingers..... the wrists..... the forearms..... the elbows..... upper arms..... and on up to the shoulders now..... feel the relaxation..... all the strain and tension draining out and away from the body..... so that the neck feels very loose and limp now..... and the jaw..... the lips..... the cheeks..... and the eyes..... right on up to the forehead..... and over the entire head now.....

The entirety of your body relaxed now..... and relaxing even more..... and more..... so that you are just as limp as an old rag doll appears to be..... and you really are that relaxed. As you listen now to what I have to say to you..... and you will want to listen extremely closely..... very, very closely please..... as you are listening just to me..... becoming aware of just what is said to you..... and of your response to what is being said to you..... and for a little while now..... with closed eyes..... and remaining relaxed..... breathing slowly and deeply..... focus your awareness on that breathing..... as you breathe in now..... and then breathing out..... in..... and out..... in..... and out..... and continue for a few seconds.

[45 seconds]

Let your eyes remain closed now..... be deeply relaxed..... and there is something of importance and value that I have to say to you now..... so concentrate just upon what I will say to you..... very fully concentrated on my words..... and on what you will experience when the words are spoken.

As you continue to breathe easily and gently..... slowly and regularly now..... comfortable and very relaxed..... feeling more at ease..... and more at peace..... at peace with yourself..... and at peace with all around you..... calmness..... peace..... and relaxation are spreading throughout every part of your mind and body. You can be so relaxed now..... that you can feel as if you're floating on a soft, soft cloud..... floating easily and gently..... so relaxed and calm..... and comfortable..... mind and body relaxing more and more.... Thoughts are fading away as you become more and more relaxed..... you

feel pleasantly relaxed as you continue to listen to my voice..... just  
 keep your thoughts on what I am saying..... as you continue to become  
 more and more relaxed..... going into a deeper..... and deeper relaxed  
 state..... very relaxed..... going deeper and deeper..... becoming  
 more and more relaxed. If you will..... imagine that you are standing  
 at the top of a stairway with five steps..... it might be a stairway  
 you know..... or..... one that you just made up..... there's a sign  
 over the stairway that says relaxation..... and as you look down the  
 stairway you know that each step represents deeper levels of relax-  
 ation..... you take the first step down..... and as you do..... you  
 become more and more relaxed..... very comfortable..... and very  
 relaxed. On down to the second step..... and then the third..... more  
 and more relaxed..... breathing regularly and deeply..... feeling  
 very comfortable..... and very calm..... and very much at ease.....  
 At step four..... becoming even more relaxed..... deeper and deeper.....  
 listening only to my voice..... breathing easily and gently.....  
 feeling very comfortable..... and very relaxed..... The last step.....  
 totally relaxed now..... more relaxed than you've ever been before.....  
 as you go deeper and deeper..... into a relaxed state..... calm.....  
 and at ease..... at peace..... and very, very comfortable. Tell  
 yourself that your mind is open now..... that you are relaxed.....  
 and at ease..... alert..... and peaceful..... and relaxed..... sharp  
 ..... clear..... focused..... and relaxed..... very alert..... and very  
 confident.....

Ten seconds after I quit talking, the list of words will begin. .  
 Remain as fully relaxed as you possibly can as you listen. I will  
 tell you when the list is over. At that time, slowly open your eyes,

and while remaining fully relaxed, turn to page three and write all the words you can recall from the list. The ten second pause will begin now. Use it to become even more relaxed.

[10 seconds]

Either

LIST III

LIST VI

library	or	attitude
blister		impulse
flood		effort
missle		crisis
insect		theory
butterfly		quality
kiss		welfare
flower		idea
bagpipe		honor
corn		majority
umbrella		excuse
doll		hypothesis
wine		hint
house		hour
tobacco		duty
woman		mercy
cradle		democracy
toast		belief
scorpion		unit
wheat		chance

The list is over. Slowly open you eyes while remaining as relaxed as possible, turn to page three and begin writing.

[3 minutes]

Time is up. Please turn to page four and answer the questions there. Thank you.

APPENDIX C

SUBJECT INSTRUCTIONS AND RESPONSE SHEETS

Hello, my name is Keith Sawyer, and I need your help in collecting some data for use in a study concerning memory. Actually, I'm looking at how the type of memory processes that take place in a college classroom might be facilitated or adversely affected.

To gather the necessary data I'll need your assistance for a few minutes at the beginning of the next few meetings of this class. During those few minutes, I'll ask you to listen to a list of words, write down as many as you can recall afterwards, and have you answer 3 questions about your experience.

QUESTIONS SO FAR ???

#### INSTRUCTIONS

Here's what I'd like you to do. In a couple of minutes I will turn on a tape recorder and you will hear a list of 20 words at a rate of about 1 word per 3 seconds. It will take approximately 1 minute to listen to all 20 words. Listen to the list carefully, and when the list is over, the tape will instruct you to turn to the 3rd page of the booklet and write down as many as you can recall in any order you can remember them. Please use the top sheets as a cover sheet as I need to know how many words you as an individual recalled. You will have 3 minutes to write down all the words you can remember at the end of which the tape will instruct you to turn to the 4th page of the booklet and answer the 3 questions listed there. DO SO IMMEDIATELY! Finish the word you may be writing and turn to the 4th page. On the 4th page are 3 questions that ask you to rate various aspects of your experience of this experiment on scales from 1 to 10. Answer the questions as truthfully and honestly as you can by circling one of the numbers along the scale.

QUESTIONS ???

Please fill in the following information.

NAME: \_\_\_\_\_ SEX: F M

SOCIAL SECURITY NUMBER: \_\_\_\_\_

COURSE NAME: \_\_\_\_\_

COURSE NUMBER: \_\_\_\_\_ DATE: \_\_\_\_\_ TIME: \_\_\_\_\_

CONDITION: CC CR CT AC AR AT

#### INSTRUCTIONS IN BRIEF

1. Listen to what ever instructions may precede the list of words and attempt to follow them as best you can.
2. Listen to the list of words and try to remember as many as you can.
3. When instructed to do so, turn to page 3 of your booklet and write down as many as you can recall in any order.
4. Stop writing when the tape instructs you to do so and turn to page 4 of your booklet and answer the questions as honestly as you can.

Please do not turn this page until instructed to do so.

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_
4. \_\_\_\_\_
5. \_\_\_\_\_
6. \_\_\_\_\_
7. \_\_\_\_\_
8. \_\_\_\_\_
9. \_\_\_\_\_
10. \_\_\_\_\_
11. \_\_\_\_\_
12. \_\_\_\_\_
13. \_\_\_\_\_
14. \_\_\_\_\_
15. \_\_\_\_\_
16. \_\_\_\_\_
17. \_\_\_\_\_
18. \_\_\_\_\_
19. \_\_\_\_\_
20. \_\_\_\_\_



1. On a scale from 1 to 10 rate your motivation to participate in this experiment today by circling the appropriate number on the scale.

Low /-----/-----/-----/-----/-----/-----/-----/-----/-----/ High  
 1 2 3 4 5 6 7 8 9 10

2. On a scale from 1 to 10 rate the extent to which you were able to follow and comply with the instructions given.

Low /-----/-----/-----/-----/-----/-----/-----/-----/-----/ High  
 1 2 3 4 5 6 7 8 9 10

3. On a scale from 1 to 10 rate how relaxed you were during the presentation of the list of words.

Low /-----/-----/-----/-----/-----/-----/-----/-----/-----/ High  
 1 2 3 4 5 6 7 8 9 10  
 [extremely tense] [extremely relaxed]

## INSTRUCTIONS

Today you will hear a different list of words, but, before you listen to the words I'd like to see if you can become more relaxed than you presently are. In a moment I will turn on the tape recorder and there will be some instructions I'd like you to follow as best you can. This will last for some 5 or 6 minutes and the tape will tell you when the list is about to begin.

Turn to page 2, fill in the information, review the brief instructions, then wait for the tape to begin.

Please fill in the following information.

NAME: \_\_\_\_\_ SEX F M

SOCIAL SECURITY NUMBER: \_\_\_\_\_

COURSE NAME: \_\_\_\_\_

COURSE NUMBER: \_\_\_\_\_ DATE: \_\_\_\_\_ TIME: \_\_\_\_\_

CONDITION: CC CR CT AC AR AT

#### INSTRUCTIONS IN BRIEF

1. Listen to whatever instructions may precede the list of words and attempt to follow them as best you can.
2. Listen to the list of words and try to remember as many as you can.
3. When instructed to do so, turn to page 3 of your booklet and write down as many as you can recall in any order.
4. Stop writing when the tape instructs you to do so and turn to page 4 of your booklet and answer the questions as honestly as you can.

Please do not turn this page until instructed to do so.

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_
4. \_\_\_\_\_
5. \_\_\_\_\_
6. \_\_\_\_\_
7. \_\_\_\_\_
8. \_\_\_\_\_
9. \_\_\_\_\_
10. \_\_\_\_\_
11. \_\_\_\_\_
12. \_\_\_\_\_
13. \_\_\_\_\_
14. \_\_\_\_\_
15. \_\_\_\_\_
16. \_\_\_\_\_
17. \_\_\_\_\_
18. \_\_\_\_\_
19. \_\_\_\_\_
20. \_\_\_\_\_

1. On a scale from 1 to 10 rate your motivation to participate in this experiment today by circling the appropriate number on the scale.

Low /-----/-----/-----/-----/-----/-----/-----/-----/-----/ High  
 1 2 3 4 5 6 7 8 9 10

2. On a scale from 1 to 10 rate the extent to which you were able to follow and comply with the instructions given.

Low /-----/-----/-----/-----/-----/-----/-----/-----/-----/ High  
 1 2 3 4 5 6 7 8 9 10

3. On a scale from 1 to 10 rate how relaxed you were during the presentation of the list of words.

Low /-----/-----/-----/-----/-----/-----/-----/-----/-----/ High  
 1 2 3 4 5 6 7 8 9 10  
 [extremely tense] [extremely relaxed]

## INSTRUCTIONS

Once again, you will hear yet a different list of words. This time, however, I'd like you to see if you can become even more relaxed than you were the last time, achieving a deeper state of relaxation. Listen to the tape and follow along with the instructions as best you can.

Turn to page 2, fill in the information, review the brief instructions, then wait for the tape to begin.

Please fill in the following information.

NAME: \_\_\_\_\_ SEX: F M

SOCIAL SECURITY NUMBER: \_\_\_\_\_

COURSE NAME: \_\_\_\_\_

COURSE NUMBER: \_\_\_\_\_ DATE: \_\_\_\_\_ TIME: \_\_\_\_\_

CONDITION: CC CR CT AC AR AT

#### INSTRUCTIONS IN BRIEF

1. Listen to whatever instructions may precede the list of words and attempt to follow them as best you can.
2. Listen to the list of words and try to remember as many as you can.
3. When instructed to do so, turn to page 3 of your booklet and write down as many as you can recall in any order.
4. Stop writing when the tape instructs you to do so and turn to page 4 of your booklet and answer the questions as honestly as you can.

Please do not turn this page until instructed to do so.

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_
4. \_\_\_\_\_
5. \_\_\_\_\_
6. \_\_\_\_\_
7. \_\_\_\_\_
8. \_\_\_\_\_
9. \_\_\_\_\_
10. \_\_\_\_\_
11. \_\_\_\_\_
12. \_\_\_\_\_
13. \_\_\_\_\_
14. \_\_\_\_\_
15. \_\_\_\_\_
16. \_\_\_\_\_
17. \_\_\_\_\_
18. \_\_\_\_\_
19. \_\_\_\_\_
20. \_\_\_\_\_



1. On a scale from 1 to 10 rate your motivation to participate in this experiment today by circling the appropriate number on the scale.

Low /-----/-----/-----/-----/-----/-----/-----/-----/-----/ High  
 1 2 3 4 5 6 7 8 9 10

2. On a scale from 1 to 10 rate the extent to which you were able to follow and comply with the instructions given.

Low /-----/-----/-----/-----/-----/-----/-----/-----/-----/ High  
 1 2 3 4 5 6 7 8 9 10

3. On a scale from 1 to 10 rate how relaxed you were during the presentation of the lists of words.

Low /-----/-----/-----/-----/-----/-----/-----/-----/-----/ High  
 1 2 3 4 5 6 7 8 9 10  
 [extremely tense] [extremely relaxed]

NAME: \_\_\_\_\_

You are one of the 11 to 13 people per class for which I was able to gather recall scores on all three days last week. To fully complete the study I would appreciate your looking over the attached list and circling the words you recognize as having heard last week in the lists presented.

It shouldn't take more than 4 or 5 minutes and I would greatly appreciate it.

Thanks,  
Keith Sawyer

Instructions:

Please circle the words you recall as having been in the lists presented last week.

abdomen	cigar	friend	item	occasion	street
ability	concept	frog	jail	officer	string
advantage	confidence	geese	jelly	opinion	style
advice	context	girl	joy	origin	substitute
agreement	cord	glutton	judge	oven	sultan
alcohol	corn	grass	kettle	oxygen	surtax
ambulance	corner	gratitude	kiss	peach	swamp
amount	cost	gravity	knowledge	pelt	teacher
angle	cotton	greed	lake	pencil	theory
ankle	cradle	grief	lark	person	thief
anxiety	creature	hall	law	piano	thought
apple	crisis	hammer	lecture	picture	time
appliance	custom	hankering	lemon	policeman	toast
aptitude	democracy	hatred	length	position	tobacco
army	deduction	heaven	leopard	promotion	tomb
arrow	doctor	hint	letter	pudding	tragedy
artist	doll	home	library	pupil	tree
attitude	dollar	honor	life	python	tribute
automobile	door	horse	majority	quality	trouble
baby	duty	hope	meadow	quantity	trumpet
bacteria	earth	hotel	memory	queen	truth
bagpipe	economy	hour	menace	quest	twilight
banker	edition	house	mercy	railroad	umbrella
belief	effort	humor	metal	rating	unification
beverage	elbow	hurdle	method	reaction	unit
bird	engine	hypothesis	mind	refrigerator	utensil
blessing	epistle	icebox	miracle	reminder	valley
blister	event	idea	mischieif	residue	velocity
bloom	examination	ignorance	missile	scorpion	volcano
boredom	excuse	illusion	molecule	shadow	water
boss	expression	impact	moment	shoes	welfare
bottle	fact	impotency	monarch	slave	wench
boulder	factory	impulse	money	snake	whale
butterfly	fantasy	industry	month	soil	wheat
cabin	fault	infant	mood	soul	window
cellar	flood	infection	moral	spinach	wine
chair	flower	insect	mosquito	spirit	winter
chance	forest	insolence	mother	stain	women
child	fork	instance	nonsense	stone	woods
church	freedom	institute	obedience	storm	world

APPENDIX D

RAW SCORES AND DATA

BY SUBJECT

## HIGH IMAGERY

Subject Number	Immediate Recall			Delayed Recognition			List Intrusion
	NA	R	DR	NA	R	DR	
1.	13	16	12	13	13	10	13
2.	11	11	13	12	9	9	11
3.	12	14	11	9	9	5	1
4.	12	6	7	10	3	4	2
5.	9	9	11	12	15	14	22
6.	11	12	10	3	10	7	5
7.	16	10	9	14	10	7	2
8.	8	8	14	9	10	11	4
9.	10	8	14	15	16	19	17
10.	13	11	13	14	9	10	9
11.	7	6	7	4	7	3	4
12.	13	12	12	8	10	12	3
13.	11	7	11	9	9	11	2
14.	13	10	13	1	3	3	0
15.	11	12	10	9	13	12	15
16.	12	13	13	8	5	12	0
17.	8	8	10	8	5	12	17
18.	14	14	12	11	15	7	2
19.	15	16	15	11	16	12	0
20.	10	8	8	16	10	6	13
21.	9	7	15	8	6	11	1
22.	11	8	15	14	8	12	2
23.	14	11	11	10	12	6	5
24.	5	5	3	4	8	6	8
25.	9	8	11	8	7	10	1
26.	8	8	10	14	13	11	4
27.	13	17	13	13	18	13	4
28.	10	8	11	14	14	10	7
29.	11	12	10	9	13	12	6
30.	17	18	16	14	17	13	2
31.	11	16	15	13	15	18	7
32.	8	10	9	9	9	10	18
33.	9	10	11	8	10	10	10
34.	7	12	9	6	11	5	2
35.	10	11	13	8	13	15	2
36.	12	10	14	10	10	13	18
37.	13	9	10	9	11	9	8
38.	11	11	11	12	12	9	9
39.	10	10	10	8	8	10	8
40.	10	13	8	12	13	9	11
41.	13	9	12	15	12	10	10
42.	9	7	11	3	5	5	1

## LOW IMAGERY

Subject Number	Immediate Recall			Delayed Recognition			List Intrusions
	NA	R	DR	NA	R	DR	
43.	6	10	9	13	12	10	15
44.	12	9	7	14	11	18	7
45.	8	8	10	5	6	2	2
46.	5	9	5	12	11	6	17
47.	10	9	7	10	7	9	7
48.	7	7	7	10	16	10	5
49.	7	8	7	11	10	7	5
50.	7	8	8	8	9	4	1
51.	8	4	5	8	6	4	10
52.	8	7	6	8	10	9	3
53.	7	7	8	4	7	6	6
54.	7	12	9	16	15	10	4
55.	6	8	4	5	10	4	3
56.	7	9	7	16	10	10	5
57.	7	7	7	4	11	3	8
58.	7	10	8	3	10	12	4
59.	6	5	5	4	6	3	6
60.	7	5	6	6	7	7	10
61.	6	7	7	3	7	4	4
62.	9	9	6	6	7	6	3
63.	4	7	7	3	5	3	7
64.	7	12	7	5	6	5	2
65.	8	11	5	9	7	5	1
66.	4	9	10	7	10	11	10
67.	6	9	8	8	14	12	2
68.	6	7	4	3	8	7	10
69.	6	4	7	7	3	5	2
70.	8	10	7	10	12	13	8
71.	5	7	5	7	7	5	22
72.	11	12	12	9	10	12	33
73.	7	11	2	11	14	7	15
74.	7	7	4	6	5	5	6
75.	9	6	8	12	8	3	7
76.	8	7	7	10	9	11	8
77.	11	13	10	7	14	10	5
78.	10	12	9	13	15	11	13
79.	7	7	8	5	5	3	14
80.	6	5	10	10	10	11	8
81.	11	12	10	14	17	14	23
82.	5	10	10	13	12	12	16
83.	5	6	9	12	7	10	29
84.	6	8	8	8	12	7	17

APPENDIX E

SCHEMATIC DIAGRAM OF EXPERIMENTAL DESIGN

		A Imagery					
		a <sub>1</sub> High Imagery			a <sub>2</sub> Low Imagery		
		b <sub>1</sub>	b <sub>2</sub>	b <sub>3</sub>	b <sub>4</sub>	b <sub>5</sub>	b <sub>6</sub>
C Level of Relaxation	B Intact Groups						
	c <sub>1</sub> Normal Awake Control	s <sub>1</sub> s <sub>2</sub> s <sub>3</sub> ⋮ ⋮ ⋮ ⋮ ⋮ s <sub>14</sub>	s <sub>15</sub> s <sub>16</sub> s <sub>17</sub> ⋮ ⋮ ⋮ ⋮ ⋮ s <sub>28</sub>	s <sub>29</sub> s <sub>30</sub> s <sub>31</sub> ⋮ ⋮ ⋮ ⋮ ⋮ s <sub>42</sub>	s <sub>43</sub> s <sub>44</sub> s <sub>45</sub> ⋮ ⋮ ⋮ ⋮ ⋮ s <sub>56</sub>	s <sub>57</sub> s <sub>58</sub> s <sub>59</sub> ⋮ ⋮ ⋮ ⋮ ⋮ s <sub>70</sub>	s <sub>71</sub> s <sub>72</sub> s <sub>73</sub> ⋮ ⋮ ⋮ ⋮ ⋮ s <sub>84</sub>
	c <sub>2</sub> Relaxation	s <sub>1</sub> s <sub>2</sub> s <sub>3</sub> ⋮ ⋮ ⋮ ⋮ ⋮ s <sub>14</sub>	s <sub>15</sub> s <sub>16</sub> s <sub>17</sub> ⋮ ⋮ ⋮ ⋮ ⋮ s <sub>28</sub>	s <sub>29</sub> s <sub>30</sub> s <sub>31</sub> ⋮ ⋮ ⋮ ⋮ ⋮ s <sub>42</sub>	s <sub>43</sub> s <sub>44</sub> s <sub>45</sub> ⋮ ⋮ ⋮ ⋮ ⋮ s <sub>56</sub>	s <sub>57</sub> s <sub>58</sub> s <sub>59</sub> ⋮ ⋮ ⋮ ⋮ ⋮ s <sub>70</sub>	s <sub>71</sub> s <sub>72</sub> s <sub>73</sub> ⋮ ⋮ ⋮ ⋮ ⋮ s <sub>84</sub>
c <sub>3</sub> Deep Relaxation	s <sub>1</sub> s <sub>2</sub> s <sub>3</sub> ⋮ ⋮ ⋮ ⋮ ⋮ s <sub>14</sub>	s <sub>15</sub> s <sub>16</sub> s <sub>17</sub> ⋮ ⋮ ⋮ ⋮ ⋮ s <sub>28</sub>	s <sub>29</sub> s <sub>30</sub> s <sub>31</sub> ⋮ ⋮ ⋮ ⋮ ⋮ s <sub>42</sub>	s <sub>43</sub> s <sub>44</sub> s <sub>45</sub> ⋮ ⋮ ⋮ ⋮ ⋮ s <sub>56</sub>	s <sub>57</sub> s <sub>58</sub> s <sub>59</sub> ⋮ ⋮ ⋮ ⋮ ⋮ s <sub>70</sub>	s <sub>71</sub> s <sub>72</sub> s <sub>73</sub> ⋮ ⋮ ⋮ ⋮ ⋮ s <sub>84</sub>	

Figure 8. Schematic diagram of experimental design



VITA

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