THE EFFECTS OF PAUSE AND REPETITION ON RECALL OF PROSE TEXT

BY

EKOJA, AJEGBA ANDREW

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Department of Education
Faculty of Education
Ahmadu Bello University,
Zaria.

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APPROVAL SHEET

This research work has been read and approved as meeting the requirements of the Department of Education, Ahmadu Bello University, Samaru-Zaria.

A. Mwanza 20/6/83
Research Supervisor

Staff Evaluator

External Examiner
21/6/83

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Much thanks to Mr. Dennys Okorafor of the Department of Library Science, Ahmadu Bello University, Zaria who did the typing of this work.

DEDICATION

This work is dedicated to my beloved mother – Onyaka Ajegba and all scholars interested in information-processing studies.

ABSTRACT

This study was undertaken to investigate the differential effects of part-vs-whole method of presentation of a text for information processing and immediate and later recall.

The sample of the study came from the parent population of first year N.C.E. students of the Advanced Teachers' College, Zaria. From a total of 307 students of the first year, the investigator randomly obtained five groups of 50 subjects (n = 50 each), the total sample being 250 (N = 250). The text consisting of 420 words on the psychology of motivation was selected from a text book of Educational Psychology (Kukberjee, 1978).

The design of the experiment ensured controls by using the foliowing treatments:

(a) the text was played through the auditory modality of sensation by playing the text pre-recorded on five different cassettes for five different methods of part-VS—whole presentation,

(b) the speed of recording being 84 words per minute,

(c) the tapes were played back on the same pitch for every group, and

(d) the five groups A, B, C, D and E received respectively five treatments such as a, b, c, d and e.

The retention ability of the subjects was measured by administering an objective text, for immediate recall, and there

was later recall after a period of three weeks. The scoring was objective as correct answers were assigned 1, mistakes being ignored.

The data was subjected to statistic analysis using the University Computer with the aid of SPSS Programme of Analysis of Variance. Analysis of data revealed that the groups differed significantly from one another in their mean recall scores and their later retention scores. On the basis of the above significant results the null hypothesis of this study was rejected and its alternative hypothesis was supported. The dissertation ends with some discussion of the issues highlighted in this study.

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ABBREVIATIONS

N.C.E.	=	Nigerian Certificate of Education
N	=	Total sample population
n	=	Group sample population

CHAPTER I

INTRODUCTION

There is a common saying in English: Public memory is proverbially short. The underlined truth of the above saying is quite obvious to most of us since we forget our experiences so quickly that when we attempt to reproduce our past learning or experience we tend to distort them either by omission or incorporation or both, without any wilful intention on our part to do so. If the ability to remember is so scanty then it poses a problem for the teachers and the learners in the classroom. When children are paying attention to a lesson the objectives of both the teachers and the learners have the same goal, that is, to recall them at a later date for survival. Granted that to be so, the concern of educationalists, especially educational psychologists, is to explore ways and means so that things learnt or experienced now will be recalled or reproduced in future with ease. At this point the question that crosses the mind of the investigator is to ask himself: How can we find out the best way of learning for the purpose of future retention in the classroom?

There is evidence from psychological research that learning follows perception and perception follows sensation. There are five different sense modalities of human beings two of which,

visual and auditory, are of major concern to both the teachers and the educational - psychologists. There is further evidence that at any point of time different types of inputs of information coming through all the different sense modalities impinge on the reticular formation that is the brainstain (Hernandez - Pten.). There is further evidence that individuals cannot pay attention to more than one particular type of sensation at the same time and also that the information arriving through the sense modalities to the sensory store is lost within one second unless the organism does something about it on its arrival. For perception to take place the selected that is filtered sensation has to undergo some mediation in the brain before a final response can be attained. The process of mediation, however, consists of analysis, synthesis, and some elementary feedback that is matching, mechanisms before the final outcome of the response or perception is attained. The whole process of this perception can however take place within $\frac{1}{3}$ of a second. Once the perception is attained then the organism can be ready to learn, comprehend and remember. The research evidence from psychological laboratories show that on immediate memory recall tests were governed by Miller's "Magical Numbers Seven Plus Minus Two Formula " (Miller, 1956). This means that the range of immediate memory of human beings lies from 5 to 9. If memory has to be retained for long periods of time then the immediate memory has to be rehearsed over and over again till the whole learning or experience is retained for good. In other words any

learning or experience for long time retention is a time consuming process.

From the above arguments it is clear that learning of anything to remember being a time consuming process we as teachers must allow during our lessons enough scope for our children for repetitions, revisions, recapitulations and pauses. Without the provision of the above in any teaching session the lessons learned during the lesson will soon be forgotten.

Another question which arises in this connection comes from our common experience of attending a public lecture for an hour or so and then mostly failing to recall what the speaker was saying for an hour. We may recall something from the beginning, something in the middle or something from the end thereby manifesting our deficiencies in information processing. This common experience has been validated from the work of Shannon and Weaver (1949). From the above arguments it therefore follows that if we as teachers provide pauses, repetitions, and recapitulations during lessons children will be retaining the lessons more effectively for future recall. The objective of this study was therefore to examine the differential effects of treatments making use of different lengths of pauses, different amounts of recapitulations and summaries during and after the lesson on later recall and retention of the lesson by the subjects.

The next chapter deals with the relevant background literature of this study.

CHAPTER II

BACKGROUND LITERATURE

2.1 Information Processing

Every individual has an intuitive view of what information is. When a person is told something he didn't know before, he has acquired some information. For example, one has acquired information when he read about the length of the world's longest moustache. However, suppose a person is told that the world's southernmost continent is Antarctica. Has he been told something? Yes. Has he acquired information? No, because he wasn't told something he didn't already know.

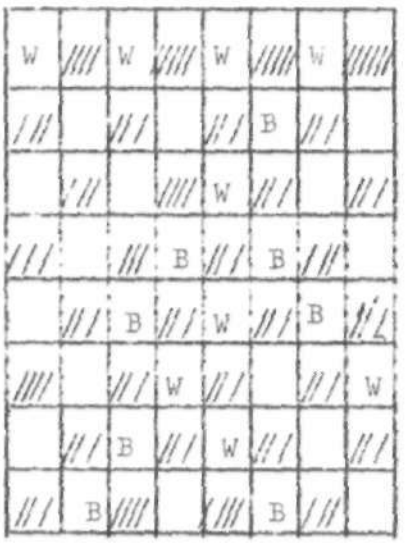
Shannon and Weaver (1949) took this intuitive notion of information and quantified it; that is, they showed how information can be made measurable. To quantify information, the first thing needed was a unit of measurement. To measure volume cubic centimeters are used; to measure distance inches are used. To measure information bits are used. A bit is defined as the amount of information that distinguishes between two equally likely alternatives. A coin has been flipped. In telling a person that the outcome of the flip was tail 1 bit of information has been conveyed to him, since prior to his being told the outcome there were, as far as he was concerned, two equally likely outcomes to the flip.

The amount of information one acquired when appraised of the outcome of the situation can be expressed by the following

equation:

$I = \log_2 N$, where I is a measure of the amount of information. This equation may be read: "the amount of information is equal to the Base-two logarithm of the number of possible alternatives".

The form of information may take on a variety of physical representations. For example, the coin itself lying on one's wrist is one physical representation. If a person says "tails," that is another representation of the same information. Changing the form of the same information from one representation to another is called recoding. A somewhat more complex array of information is now being considered: the configuration of a checker board. Figure 2.1a shows one representation of the same information. To get figure 2.1b, the information in Figure 2.1a is taken and recoded. Figure 2.1c shows yet another representation that is a recoding of the information in figure 2.1b. An interesting thing is noted: the recoding from figure 2.1a to figure 2.1b has preserved all the original information. Therefore, figure 2.1b could, if desired, be used to reproduce figure 2.1a and vice versa. In the recoding from figure 2.1b to figure 2.1c, however a good deal of the original information - namely, the position of the checkers - has been lost, and figure 2.1c could not be used to reconstruct figure 2.1b or figure 2.1a. When information is recoded, therefore, it is possible for some of the original information to be lost.



(a)

Square	Occupant	Square	Occupant	Square	Occupant	Square	Occupant
1	White	17	None	33	None	49	None
3	White	19	None	35	Black	51	Black
5	White	21	White	37	White	53	White
7	White	23	None	39	Black	55	None
10	None	26	None	42	None	58	Black
12	None	28	Black	44	White	60	None
14	Black	30	Black	46	None	62	Black
16	None	32	None	48	White	64	None

(b)

Nine White Checkers

Eight Black Checkers

( )

Figure 2.1 Recoding of Information. Each panel provides information about the configuration of checkers on a checkerboard:

(a) representation by a picture;

(b) representation by a list,

(c) representation in terms of numbers of black and white checkers.(Loftus ,and Loftus, 1976)

An important tool for any scientific theory is a model or physical analog of that about which one is attempting to theorize. For stimulus - response psychologists, the model is a telephone switchboard with calls coming in from the environment (stimuli) being routed via switchboard connections to the appropriate telephone (responses). For psychologists working within an information - processing framework, a computer provides an apt analogy of what is happening inside a person's head. The old view of a computer as a "giant brain" is taken seriously, except that it is somewhat reversed - a human brain is seen as a "midget computer." Both computers and people are information - processing systems, and Figure 2.2 shows a schematic view of the analogy. Both computers and humans take in information from the environment. Computers do this using card readers, tape drives, etc; whereas humans do it using their sense organs. Inside a computer, the information from the environment is manipulated recoded , and combined with other information already there. This is done via activation of electronic registers. Inside a person, information

is manipulated, recoded, and combined with other information already there. This is done via activation of neurons. Finally, a computer outputs information to the environment via output devices, such as teletypes and line printers. Likewise, humans output information to the environment via such output devices as mouths and hands.

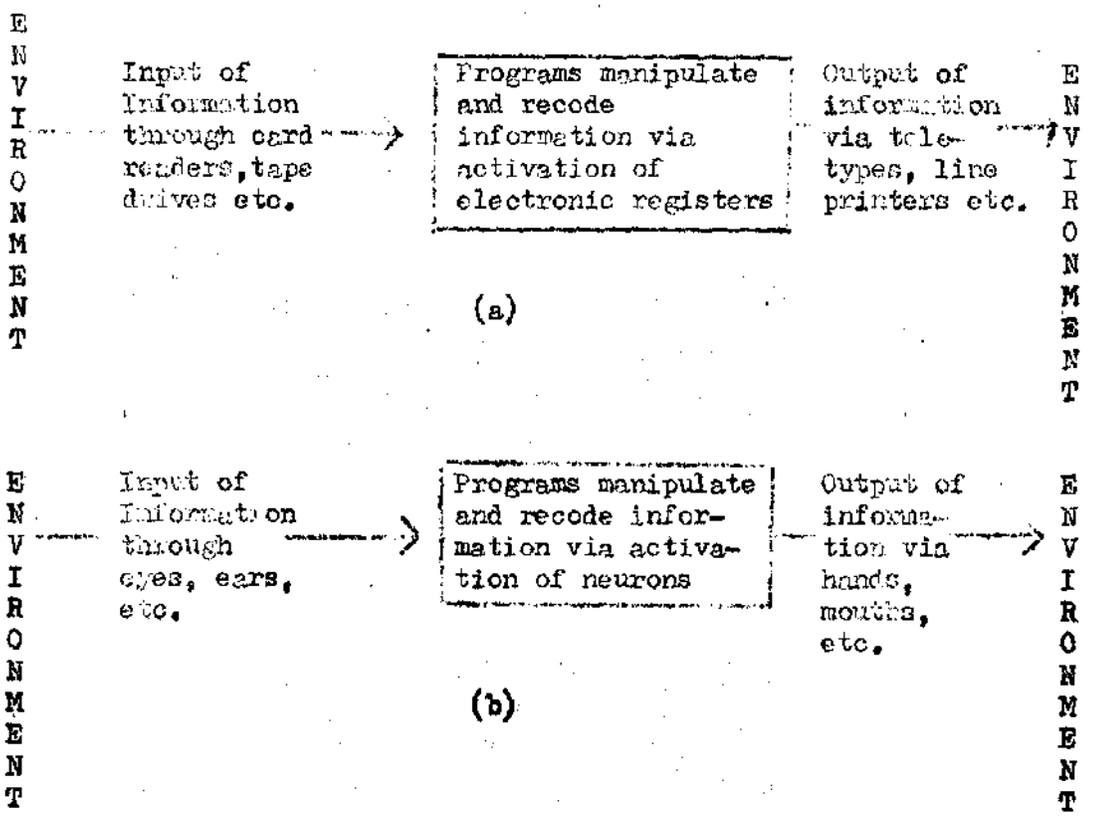


Figure 2.2 Similarity of information processing in computers and in humans: (a) computers; (b) people (Lofus and Loftus, 1976)

A model of memory has been advanced in one form or another by a number of psychologists (Waugh & Norman, 1965; Glanzer, 1972) and was described in its most complete form by Richard Atkinson and Richard Shiffrin (Atkinson and Shiffrin, 1968, 1971). Atkinson and Shiffrin formulated the theory as a mathematical model; this meant that the theory's assumptions took the form of mathematical equations and that it made specific, quantitative predictions about the outcomes of various experiments.

Figure 2.3 represents a schematic (and somewhat over-simplified) view of the memory and information -- processing system according to this theory. The boxes represent "stores" or repositories of information; the arrows represent the flow of information from place to place. To see how the system works, it is imagined that one looks up a telephone number, such as 325-5606. Let the course of this information be traced as it makes its way through the system.

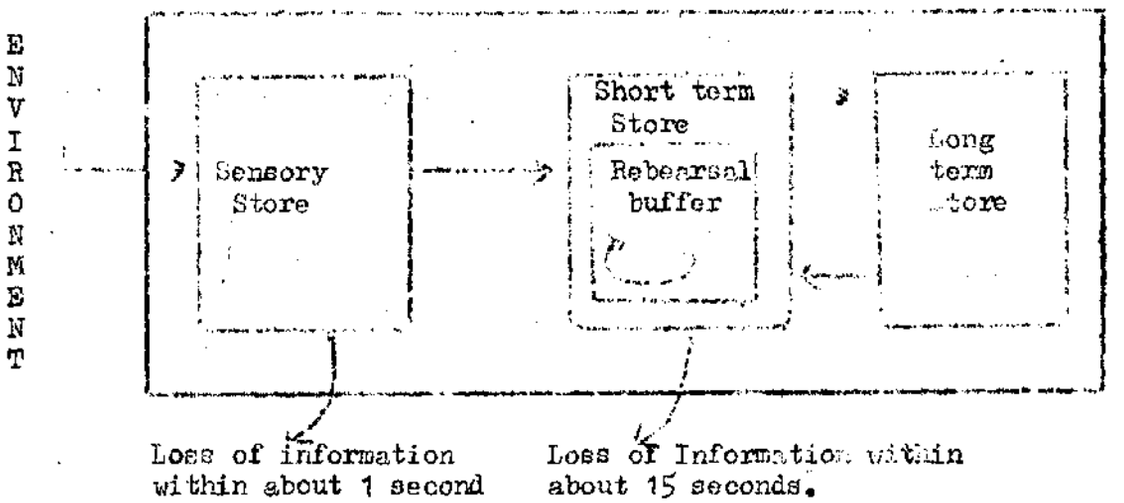


Figure 2.3 A Schematic view of the two-store memory system. (Loftus and Loftus 1976)

The information first enters the system through one of his sense organs. In this case, the number is presented to him visually, so it enters through his eyes. The first store into which the information is placed is called sensory store. Sensory store can hold a large amount of information; in fact, it holds virtually all the information impinging on a particular sense organ. If the number in the telephone directory has been looked up, therefore, not 325-5606 but all the other information on the page of the directory enters sensory store. However, information in sensory store decays away very quickly - in most cases within a second or so. Therefore, unless information in sensory store is quickly transferred somewhere else, it will be lost.

Some of the information in the sensory store is indeed transferred into the next store, which is called short-term store. Short-term store (which may be introspectively equated with consciousness) has several major characteristics. First of all, it is of a limited capacity; it is large enough to hold one telephone number, but probably not large enough to hold two. Second, information in short-term

store is, in general, lost within about 15 seconds; all people have had the experience of looking up a telephone number and walking across the room to dial it, only to discover that the number had been lost by the time they reached the telephone. However, information in short-term store may be placed into a special section of short-term store called a rehearsal buffer. Information in the rehearsal buffer does not decay away but may be maintained indefinitely via the process of rehearsal. Rehearsal means just what it is been thought it means that information is repeated over and over. So if one entered the number 325-5606 into one's rehearsal buffer, it can be maintained by repeating it to oneself "325-5606, 325-5606...." for as long as one wishes.

Which information gets entered into the rehearsal buffer? The theory assumes that people have the ability to enter whichever information they wish into the rehearsal buffer, allowing other information to decay away from short-term store. The choice of which information is to be entered and which is to be lost is presumably made in such a way that the person can carry whatever task he is trying to do. So, for example, when a person's number in the telephone directory is looked up, the person's address may also be found. If the person is to be called up, one would enter the number into the rehearsal buffer, and allow the address to decay away. If, however, one intended to write the person a letter, it would be more prudent to enter the address into the rehearsal buffer, and allow the number to decay away.

The final component of the system is long-term store. Long-term is the virtually unlimited-capacity store of that information which individuals have more or less permanently available to them. For example, persons' names, the multiplication table, people's ability to speak a language, the days of the week, and so on, are all stored in long-term store. How does all this information get into long-term store? It is assumed that while information resides in short term store it can be copied or transferred into long-term store. The longer some particular information resides in short-term store, the more of that information can be transferred into long term store. If one seats around repeating "325-5606" over and over to himself, he is maintaining it in short-term store. Additionally, during this time, information about the number may be transferred to long-term store. In other words, he can memorize the number.

Suppose now one is called on to retrive some information that has previously been presented to him - for example, suppose he has to dial the number he has looked up. He first checks to see whether that information is in short-term store. If it is in short-term store, that's fine; he simply retrieves the information and uses it. If the information is not in short-term store, he doesn't despair yet, for the information may have resided in short-term store long enough for it to be completely transferred to long-term store. Therefore, if the information is not in short-term store, he next searches long-term store, and if the information is there it can be retrieved

and used (Retrieval and utilization of information from long-term store essentially consists of transferring information from long-term store to short-term store. This is represented by the arrow pointing left in Figure 2.3) It is possible of course, that some but not all of the information has been transferred to long-term store. Thus, one may remember the exchange, 325, but not the rest. One may remember 325-560 - , and remember that the last digit was even. The information corresponding to the degits themselves might have been transferred but not the information about their order, in which case one may retrieve the number 325-6506 and dial a wrong number.

This, then is a very brief sketch of how the memory system is assumed to operate. The type of memory system described is often referred to as a two-store system in reference to its two major information stores, short-term store and long-term store.

Information impringing on the senses initially goes in what is called sensory store. The term "sensory store" is actually a misnomer because there are several different sensory stores, one corresponding to each sense modality. Visual information entering the eyes is initially placed into a visual sensory store, called iconic store. Auditory information entering the brain through the ears is initially placed into a sensory store corresponding to audition, called echoic store. Although there are other sensory stores corresponding to other

modalities, psychologists have concentrated most of their research activity on iconic and echoic stores. This is because human behaviour, for the most part, is based on information that is initially visual or auditory.

Iconic store is thought to be a complete but brief repository of all information that initially enters the brain through the eyes. The first question one must deal with is: what leads people to believe that iconic store exists? What evidence supports the assertion that there is indeed a large-capacity visual store? A classic set of experiments performed by George Sperling (1960) provides answers to these questions.

Sperling's discovery of iconic store began somewhat obliquely with the seemingly unrelated question: How much of a visual stimulus can a person see when that stimulus is presented for a very brief period of time? (By "very brief" is meant a period of time ranging from 10 to 200 milliseconds where a millisecond is 1/1000 of a second.) Sperling's major reason for investigating this question was that visual behaviour in general is made up of a series of "brief visual presentations". Ask a friend to look around the room and watch his eyes as he does so. It is to be noticed that eyes do not describe a smooth continuous motion as they move around. Instead, they are still for a brief period, quickly move to another position, are still for another brief period, move again, are still again, and so on. The periods during which the eyes are

still are called fixations; the quick eye movements separating fixations are called saccades. Visual information is taken in by the eyes during the fixation periods, whereas vision is essentially suppressed during saccades. Saccades occur at the rate of about three per second; each fixation therefore lasts for a period of about 300 milliseconds. It is seen then that the eye is constantly presenting the brain with a series of brief visual presentations in the form of fixations; therefore the question of how much a person can see during such a presentation becomes quite important.

Since the late 1800s numerous investigators (McDougall, 1904; Whipple, 1914) have done numerous experiments dealing with the above question. Arrays of items (for example, letter arrays such as those shown in figure 2.4) have been briefly presented to a subject in a tachistoscope. (A tachistoscope is an optical device for presenting visual stimuli very briefly, often just called a t-scope.) After he had viewed the array of letters, the subject in this typical experiment was simply asked to report back as many of the letters from the array as he could remember. Suppose one now plots the average number of letters reported by the subjects as a function of the number of letters presented in the array. The results obtained by such a procedure are shown in Figure 2.5. If up to about four of five letters are presented, the subject is perfect; he is able to report them all back. The initial part of the curve in Figure 2.5 therefore rises linearly. However, if more than four or five letters are presented in the array, the subject is not able to report the additional letters but is

still only able to report four or five. The curve in Figure 2.5 therefore flattens out after four or five letters. The conclusion drawn from studies such as this typical one is that the amount a person is able to see in a single brief visual presentation is apparently constrained to about four or five items. This finding has been replicated many times and the apparent limit of four or five letters has been given a name: it is called the span of apprehension.

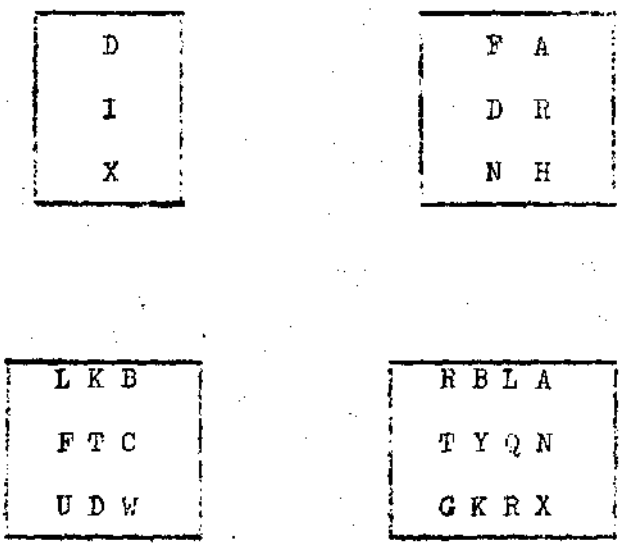


Figure 2.4 Arrays used in a typical experiment to measure the information available in a brief visual presentation.

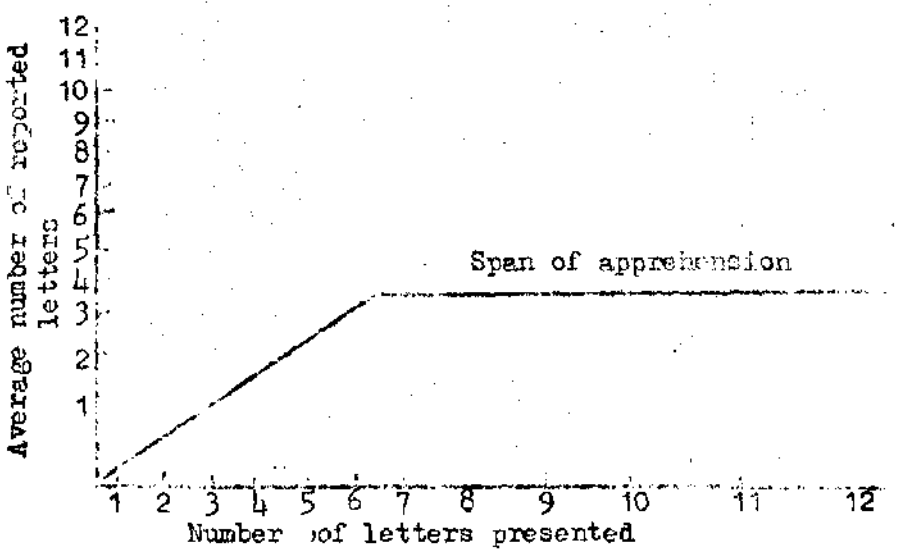


Figure: 2.5 Results obtained in a typical experiment to measure the infor[illegible]

As with many findings in psychology, however, this experimentally determined span of apprehension was at odds with what subjects thought was happening. In particular, subjects had two introspective reports that conflicted with assumptions experimenters were making about the experimental situation. First, it was assumed that subjects had the capability of reporting all the letters they saw in the array, that is, that what was reported constituted a completely faithful index of what was seen. "Not so!" said the subjects. Consider an array of 12 letters. Although subjects could only report four or five of the 12 letters, it was not the case, they said, that they only saw the four or five letters but as they were writing down the first four or five, they forgot the last seven or eight. According to this notion, then, the experimentally determined span of apprehension resulted not from a limit on how much could be seen but was instead caused by a limit on how much of what was seen could be retained.

The second assumption was that the amount of time the subject had to perceive the array was exactly equal to the amount of time the array was presented. If an experimenter turned on the array of the tachistoscope, left it on for 50 milliseconds and then turned it off, it seemed only reasonable to expect that the subject has only those 50 milliseconds to perceive the array. Again, the subjects disagreed. From their point of view, it did not appear as though the array was been abruptly turned off; it appeared to be gradually fading away over the course of a second or so. It therefore seemed

that they were still seeing the 50 millisecond array for up to about 950 milliseconds after it had physically vanished.

In the experiment just described, subjects were asked to report all the letters they could from the array; in other words, they were being asked to make a whole report of the letters in the array. According to the subjects, however, this was a very bad procedure, because as noted some letters were forgotten while others were being reported. To rectify this problem, Sperling devised a partial report procedure, depicted in Figure 2.6.

In a partial report procedure, as in a whole report procedure, the subject is initially presented with the array (say a 3x4 array) for 50 milliseconds. The twist is that the subject is not required to report all the letters in the array. Instead, they are required to report only one four-letter row. The subject is told which row to report by means of a signal that occurs immediately after the array is turned off. The signal takes the form of a tone played to the subject through earphones. A high-frequency tone indicates that only the top row is to be reported; a medium-frequency tone indicates that only the middle row is to be reported; and a low-frequency tone indicates that only the bottom row is to be reported.

Using the number of letters per row that the subject was able to report using this procedure, Sperling was able to estimate the total number of letters the subject must have

had available at the instant the array was turned off. Suppose, for example, that on the average, the subject was able to report three out of the four letters per row. Because the subject did not know beforehand which row he was going to have to report, this must mean that he had three letters available from each of the three rows. The total number of letters estimated to be available would therefore be three rows times three letters per row, or nine letters in all.

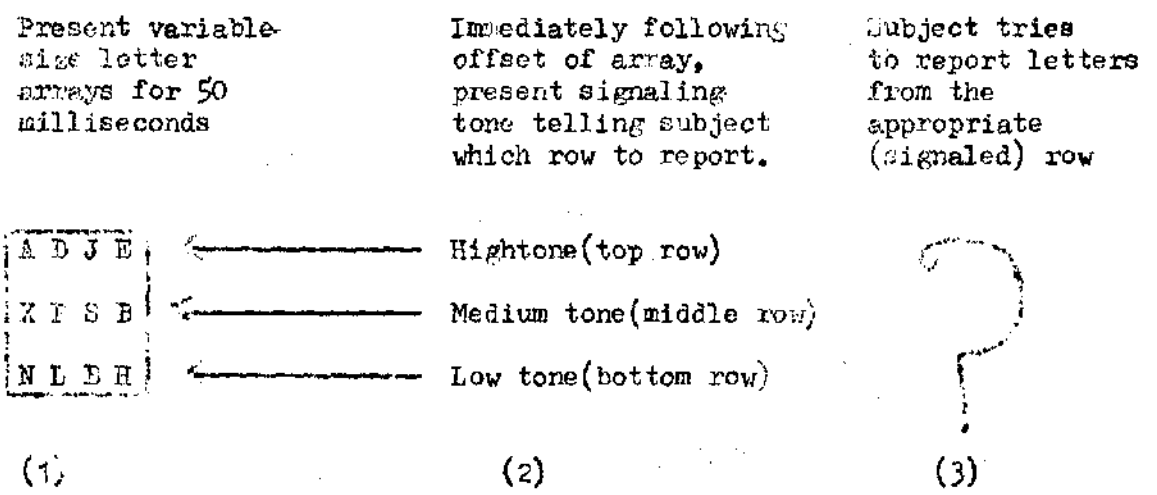


Figure 2.6 Sperling's (1960) partial report technique

Sperling now performed the experiment described above, presenting arrays of letters for 50 milliseconds, varying the numbers of letters contained in the array, and seeing how much of the array subjects could report back for each array size, however, the experiment was performed using both whole and partial report procedures.

The result is very important, for it shows that the span of apprehension does not, as early experimenters assumed, accurately measure the amount of information that subjects are able to perceive. Instead, the result gives experimental support to the introspective feeling that during a brief visual presentation people are able to see more than they are ultimately able to report.

2.2 Attention and Memory

It is believed that information held in sensory store is raw, sensory information as yet unanalyzed for meaning. What evidence supports the assertion that information in sensory store has not yet been analyzed for meaning? An experiment performed in the series by Sperling (1960) provides us with such evidence. In this experiment, Sperling used arrays such as the one shown in Figure 2.7. These arrays contained not just letters, but a mixture of letters and digits. Sperling now used the usual control condition of whole report, plus two types of partial report conditions. The first partial report condition was just like that used in prior experiments; the subject was simply instructed (with a high or low tone) to report either the top row or the bottom row. As expected, subjects in this condition showed a marked advantage over the whole report condition in terms of number of available symbols (letters and digits). In the second partial report condition, a high tone indicated that only the digits were to be reported. Suppose now there is information in iconic store about whether

a particular symbol is a letter or a digit (that is, information about the meaning of the symbol). In this case, the partial report advantage should appear. For example, a subject signaled to report only letters could simply scan through iconic store picking out the letters and ignoring the digits much in the same way as he can go through picking out, say, only the top row symbols and ignoring the bottom row symbols. However, the partial report advantage did not materialize in the letter-digit condition. Using a partial report based on letters versus digits, the number of symbols estimated to be available to the subject was only four or five letters, which was no better than the number of symbols estimated in the whole report procedure. The conclusion that was drawn from this result is that when an array of the sort shown in Figure 2.7 is in iconic store, the eight symbols are, as far the subject is concerned, simply visual patterns. The subject does not yet have the ability to distinguish among the patterns in terms of what the patterns represent, whether they are letters or digits.

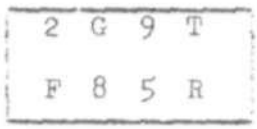


Figure 2.7 Types of arrays used in Sperling's (1960) third experiment.

It has been noted that information cannot really be used while it is still in the sensory store. Before information of any real value, therefore, it must be can be transferred out of sensory store and into some other store where meaning becomes attached to it. Pattern recognition

is the term used to describe the process of transferring information from sensory store to short-term store. The term "pattern recognition" is used to describe this transfer process because the process essentially consists of "recognizing" a raw, physical pattern in sensory store as representing something meaningful. Pattern recognition is extremely complex and, more complete discussions have been undertaken in the work of Neisser (1967) and Lindsay and Norman (1972).

In order to discuss pattern recognition, let one look at distinction between a symbol (say a visually presented symbol) and a concept, which that symbol is used to represent. Figure 2.8 illustrates this distinction. On the left side of Figure 2.8 are shown various visual symbols. On the right side are described, to some extent, the concepts those symbols are used to represent. The first symbol, for example, is the pattern "A". The concept represented by the physical pattern "A" constitutes a complex array of information, including pronounciation roles, first letter of the alphabet, first letter of the word "apple", vowel, last letter of the word "pizza", and so on. The process of recognizing a patten, then consists of deciding which of all possible concepts a particular pattern corresponds to.

It is currently believed that this task is carried out via a feature-detection analysis. A particular pattern may be thought of as being made up of a collection of elementary features. The pattern "A" for example, can be thought of as

having such features as two straight diagonal lines, one horizontal line, three acute angles, two oblique exterior angles, etc.

Pattern	Concept that Pattern Represents
A ——————————→	First letter of the alphabet Vowel Represents a good grade etc.
B ——————————→	Second letter of the alphabet Consonent Beginning of the word "bottle" etc.
Z ——————————→	Last letter of the alphabet Consonent Represents the sound of a person snoring etc.

Figure 2.8 Symbols (visual patterns) and the concepts they represent.

Evidence for this kind of feature-testing model comes from a variety of sources. It shall be mentioned here briefly two types of evidence: behavioural evidence and physiological evidence.

Behavioural evidence for a feature-testing model has been gathered by Ulric Neisser and his colleagues, using what is termed a visual-scanning task (Neisser, 1963, 1964, 1967; Neiser, Novak, and Lazar, 1963; see Egeth, 1967). Visual scanning is what a person engages in when he enters a crowded bar or restaurant and search (scan) through the crown to find

a friend who was supposed to meet him there.

In the physiology laboratory, an extensive series of experiments has been carried out by Hubel and Wiesel (1959, 1962) on response patterns of individual brain cells to various types of visual stimuli. Hubel and Wiesel's procedure involved anesthetizing a cat and then placing a tiny electrode into the portion of the cat's brain known as the visual cortex. When the electrode was indicating the activity of a single neuron, various simple visual stimuli were shown to the cat (which was still fully conscious). The findings were dramatic: certain cells responded only to very specific visual patterns. For instance, one cell responded only to a vertical line, another only to a horizontal line, and so forth. Such cells may therefore be viewed as elementary feature detectors and Hubel and Wiesel's confirmation of their existence provides fairly compelling support for a feature-testing model.

Figure 2.9 illustrates how the pattern-recognition process fits into the information-processing already discussed. To briefly reiterate, the physically pattern "A" enters the eyes from the environment and is placed into iconic store. The pattern recognition program then has the job of transferring this raw sensory information from sensory store into short-term store. In the process two things happen. First, the physical representation of the information is changed or recoded. Second, the raw sensory information from the environment is supplemented by information already stored in long-term store.

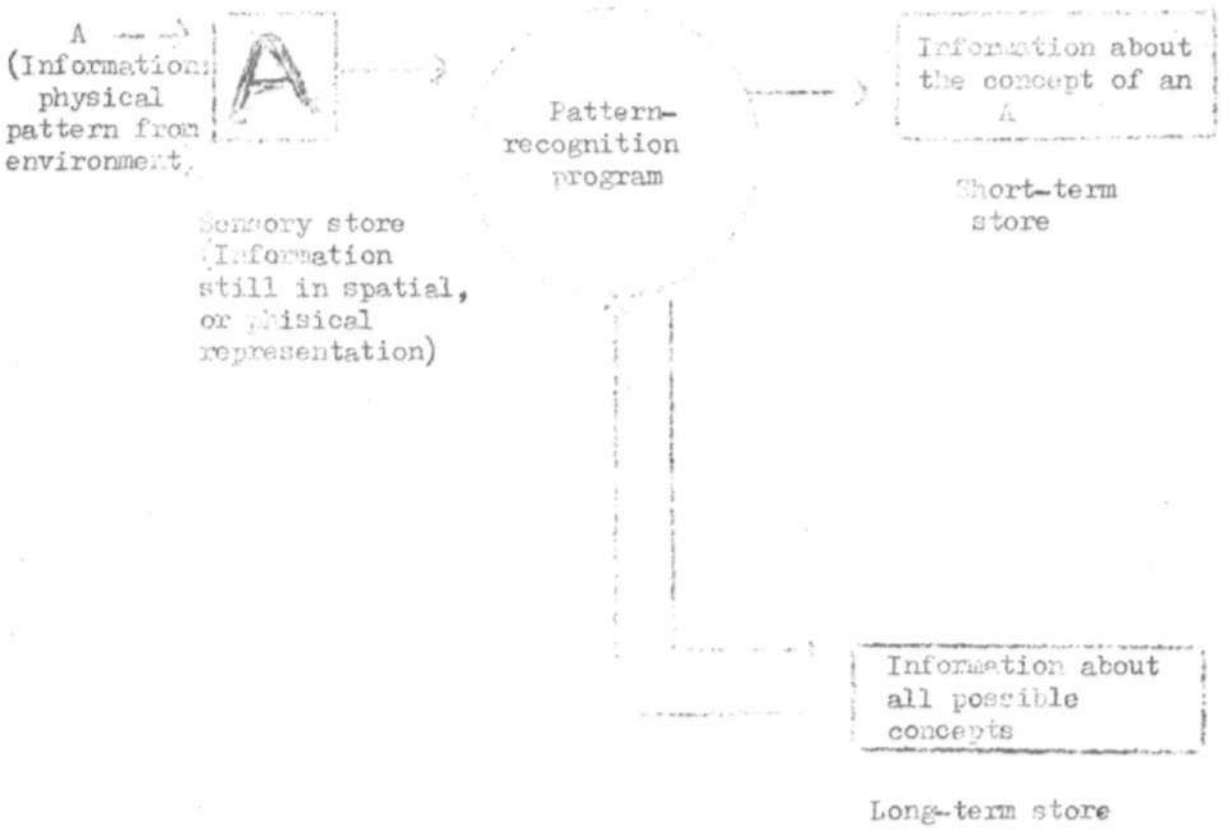


Figure 2.9 How a pattern-recognition program fits into the information-processing system. (Loftus and Loftus 1976)

To completely recognize a pattern, the program must ask a long series of questions about the pattern, and it therefore seems that the process must be long and tedious. Exactly how long does pattern recognition take? This, of course, is a very important question, for the rate at which pattern recognition occurs places an initial limit on the speed which one is able to interact with the environment.

Sperling (1963) has reported the first results germane to this question. The logic of this experiment is very simple and goes as follows: suppose a subject is presented with array of, say, five letters, and, furthermore, suppose the amount of the time the string

is presented is varied. It is then asked how many letters the subject is able to report back as a function of how long the string was presented. It is assumed that in order that a letter from the string be reported, the letter must be pattern recognized. That is, information about the presence of that letter in the string must be transferred to short-term store. Now, suppose that one letter can be reported from a string that has been presented for 10 milliseconds, two letters can be reported from a string that has been presented for 20 milliseconds and so on.

As it has no doubt been figured out, this hypothetical experiment has a serious flaw; it assumes that a subject can extract information from the letter string only when the string is physically present. However, it has been seen that this assumption is false and that information can be extracted from the iconic image of the string for some time after the physical stimulus has disappeared. Fortunately, there is a way to correct this flaw. It turns out that if a briefly presented visual stimulus is quickly followed by a second visual stimulus in the same spatial location (referred to as a masking stimulus) the masking stimulus erases the initial stimulus from iconic store, rendering it impossible for the subject to further extract information from the initial stimulus.

The results of this experiment show that up to about 40-50 milliseconds, about one letter can be reported for every 10 milliseconds of stimulus presentation time. It therefore appears

in this experiment, the time taken to pattern recognize one letter is 10 milliseconds, or a hundredth of second, which is very fast. Why does the function level off? Two possibilities exist. The first possibility is that short-term store can only hold about four or five letters and so short-term store quickly becomes filled. The second possibility is that the pattern-recognition process works in "bursts" - that is, the program can operate for only about 100 milliseconds but then needs a rest before it can operate again.

Sperling's second experiment bears on this question, (Sperling, Budiansky, Spivak and Johnson, 1971). It went as follows: during a given trial in the experiment, the subject saw a series of from six to twelve arrays of letters flashed sequentially on a cathode - ray screen in front of him. (A cathode - ray screen is similar to a television screen.) The catch was that one location of one of the arrays contained not a letter, but a digit. It was the subject's job to report which location contained the digit. The amount of time each array was left on before being replaced by the subsequent array is termed the interstimulus interval. In this experiment, the stimulus interval varied from 5 to 320 milliseconds.

Sperling et al. (1971) assumed that when a particular array appeared, the subject began "scanning" the items in the array in an attempt to determine which, if any, of the locations contained the digit. By "scanning" is simply meant pattern recognizing the items one by one. Using the probability that the subject correctly reported the position of the digit, it

was possible to estimate how many items had been pattern recognized from each array. Suppose, for example, that this probability were 0.67. We could then infer that the subject has pattern recognized two-thirds of the items in each array, or six out of the nine items in the array.

In this experiment, it is to be remembered that the subject was not required to remember the symbols he was pattern recognizing (as his only task was to find the digit). Therefore he has no need to fill up short-term memory.

The last question one asks in this section is: Which information is transferred out of sensory store? Sensory store can hold a good deal more information that can short-term store. Therefore a person must take a choice about which information is to be transferred to short term store and which is left to decay away from sensory store. In deciding which information to transfer, one is essentially deciding what is going to be attended to. In turn, this choice is more likely dictated by the task one is trying to accomplish. Subjects in Sperling's partial report procedure, for example, had to report all the letters from a particular, designated row of the letter array. A high tone signaled the subject to attend to the top row and to begin pattern recognizing the top row letters at the expense of the middle and bottom row letters.

2.3 Memory and Recall

Long-term memory contains what seems to be an infinite amount of information. It contains facts about individuals' personal experiences. Endel Tulving (1972) has used the term episodic memory to refer to people's record of personal life experiences. In general, episodic memory contains an information the basis for retrieval of which is some association with a particular time and/or place. For example, the information that "I learned the words 'hats', 'picture,' and 'grandfather', in a psychological experiment today" is episodic information.

In contrast to episodic information, however, one's memory also contains information that is not associated with a particular time or place, for example, the fact that a banana is yellow. The term semantic memory is used in reference to this nonepisodic information. Semantic memory includes the organized knowledge people have about words and other verbal symbols, their meaning, and referents; about relationships among them; and about rules of manipulating them. In addition to quickly being able to find the answer to a question that has been asked before humans are also very good at producing a response to questions that they have never been asked before. Let one consider, for example, these questions:

1. Who was the first President of the United States?
2. What is the name of a Republican President?
3. What is the name of a fruit beginning with the letter P?

There is not much trouble with these questions; in fact, most people can easily answer them within a few seconds. However with all the information that people have stored, how do they do it? How do they manage to so quickly have access of the information necessary to answer these questions.

To pose the question more specifically, it can be asked whether the processing of finding a desired item in semantic memory involves a "successive-scanning" process. Successive scanning here means to enter the memory store at some point or location and scan items one at a time until the sought-after information is found. If asked for the name of the first president of the United States for example, one may go to the place in memory where "Presidents" are located and scan one by one until the one that is coded "first President" is found. Hopefully, it is George Washington. If asked to name a fruit beginning with letter P, a person may go to his "fruits" and scan them one by one until one beginning with P is found. This is what is meant by successive scanning.

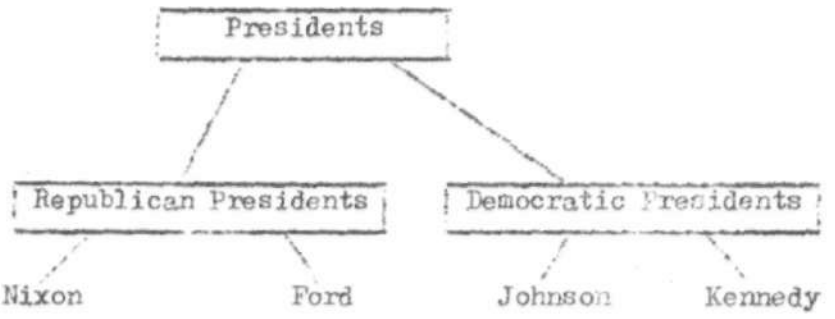


Figure 2.10 Hypothetical portion of semantic memory containing information about Presidents (Loftus and Loftus, 1976).

Alternatively, retrieval may not involve successive scanning of the contents of the memory store. As an example of what may be happening if one is not scanning successively, suppose again that it is being asked for the name of a Republican President. A person may go to the location in memory where "Presidents" are stored and there a subcategory of "Republican Presidents" may be found as shown in figure 2.10. The subcategory may be entered and the first item found there be picked. Although it is being talked somewhat loosely the basic point is that information is retrieved by some process, and the question is: to what extent does the process involve successive scannint?

To investigate these and other related issues, Freedman and Loftus (1971) asked subjects to answer a large number of simple questions similar to the ones above. The specific purpose of the Freedom-Loftus experiment was to determine whether a sugject finds an appropriate instance by successively scanning through instances of the category. If he does, then it ought to take longer to produce a member of a larger category than to produce a member of a smaller one. For example, a subject should take longer to name a fruit starting with P than to name a season starting with W. The result of the experiment indicated that this was not the case. That is to say, subjects took no longer to name a member of a large category than a member of a small category. Freeman and Loitus conclude that people probably do not use a successive scanning to retrieve information from semantic memory.

What factors do influence retrieval speed? To answer this question, Freedman and Loftus presented stimuli to their subjects using one of two methods. In the first method, the letter was shown first, followed by a pause, and then the category. For example, the letter P was shown, followed soon afterwards by the category "fruits". The subject may respond with "peach", "pear", or "plum", among other possibilities. Reaction time was measured from the time "fruit" appeared until the subject made his response. With this "letter first" method of presentation, as soon as the category "fruit" is shown, the subject must do this: First he must find the place in memory where information about "fruits" is stored; in other words, he must go to or "enter" his "fruits" in memory. Let the time needed in this step be called t_1. Next, the subject must retrieve the relevant information from the category; that is, he must find an instance of the "fruit" category that begins with the letter P. Let the time needed for this step be called t_2. Finally, the subject must produce a response. The time needed to do this is referred to as K. The total reaction time (RT_1) to respond when given the stimulus "P-fruit" is therefore

$$RT_1 = t_1 + t_2 + k$$

For half of the questions asked of any subject, the second method of presentation has been used: the category was presented before the letter. In the example that has been discussed, "fruits" was presented, followed by a pause and then the letter P. Reaction time in this case was taken from presentation of P until a response was made. With this "category

first method of presentation, it is possible for the subject to go to or enter the category during the interval between "fruit" and P. Therefore the time t_1 is not included in the total measured reaction time, and the reaction time in this case is

$$RT_2 = t_2 + k$$

By substracting RT_2 from RT_1 one can get an estimate of reaction time, the time needed to enter the category (see figure 2.11). In typical experiments, t_1 turns out to be about 250 milliseconds, or a quarter of a second. It can therefore be seen that there is fairly good evidence for a two-step theory of retrieval.

Condition 1:

"P" - interval - "Fruit" $|RT_1|$ Response (e.g. "Pear")

$RT_1 = t_1$ (enter fruits)

$+ t_2$ (find a fruit beginning with P)

$+ k$ (respond)

Condition:

"Fruit" - interval - "P" $|RT_2|$ Response (e.g. "Pear")

$RT_2 = t_2$ (find a fruit beginning with P)

$t \quad k$ (respond)

Figure 2.11 Reaction time taken to produce a fruit beginning with the letter P depends on whether "FRUIT" or "P" is presented first (Loftus and Loftus, 1976)

The question that needs to be asked at this stage is: how does one retrieval affect another? Several experiments have been conducted on the issue of how one retrieval from memory affects another. Collins and Quillian (1970), for example have presented

such sentences as "A canary is a bird" and required their subjects to decide whether the sentences were true or false. Prior exposure to one sentence, they have found, reduces the reaction time to a second sentence, sometimes by over a half a second, whenever the same subject noun has been used. To illustrate, prior exposure to "A canary is a bird" reduced the time subjects took to verify other sentences about canaries.

Facilitation has also been observed in experiments in which a subject must name a member of a category, and some time later must name a different member of the category (E.F. Loftus, 1973a; Loftus and Loftus, 1946b). Let one try this: What is the name of a fruit beginning with the letter A? Now, what is the name of a fruit beginning with P? People usually answer the second question much more easily if it has been preceded by the first one. Why should this be?

One possible explanation is that the first retrieval of a "fruit" increases the accessibility or "activates" one or more memory locations, making information retrieval from them easier when the second retrieval is made. For example, presentation of the category "fruit" may activate the memory location representing the category namely itself, and it may, in addition, activate the locations that are nearby the location of the category name. If one adds the plausible assumption that this greater accessibility of the memory location(s) is temporary and decays gradually (after all, things cannot stay activated forever), then one additional prediction can be made: as one increases the time, or the number of different unrelated questions, that intervene between the two critical questions, one should reduce the facilitating effect.

Before one gets into theories of semantic memory it should be pointed out a serious limitation inherent in such theories: in order to theorize about a retrieval process, it needs to be known something about the structure from which a person is retrieving. Any theory of retrieval from semantic memory must also postulate a structure of semantic memory. Structure and retrieval are inextrically entwined. This places an inherent limitation on the extent to which an experiment can be used to test either the retrieval or the structural aspect of some theory, because if an experiment does not support the theory, there is no way to know which aspect of the theory is at fault. It is the structure or the retrieval process that should be revised? Some models of semantic memory shall now be turned to and it shall be seen how this problem has been handled.

Allan Collins and Rose Quillian (1969), wrote a paper entitled "Retrieval time from semantic memory." In this paper it has been suggested that the items stored in semantic memory are connected by links in a huge net work. Figure 2.12 presents a portion of this hypothetical memory structure. It is to be noticed that the concepts in this structure are hierachically organised into logically nested subordinate-superordinate relations. For example, that "CANARY is BIRD" is superordinate to the subordinate that "BIRD is ANIMAL". It is to be noticed further that a property characterizing a particular class of things is assumed to be stored only at the place in the hierarchy that corresponds to that class.

This assumption has been called the assumption of "cognitive economy". For example, a property that characterizes all birds (such as the fact that they have wings) is stored only at BIRD. It is not stored again with the different types of birds, even though other types of birds also have wings.

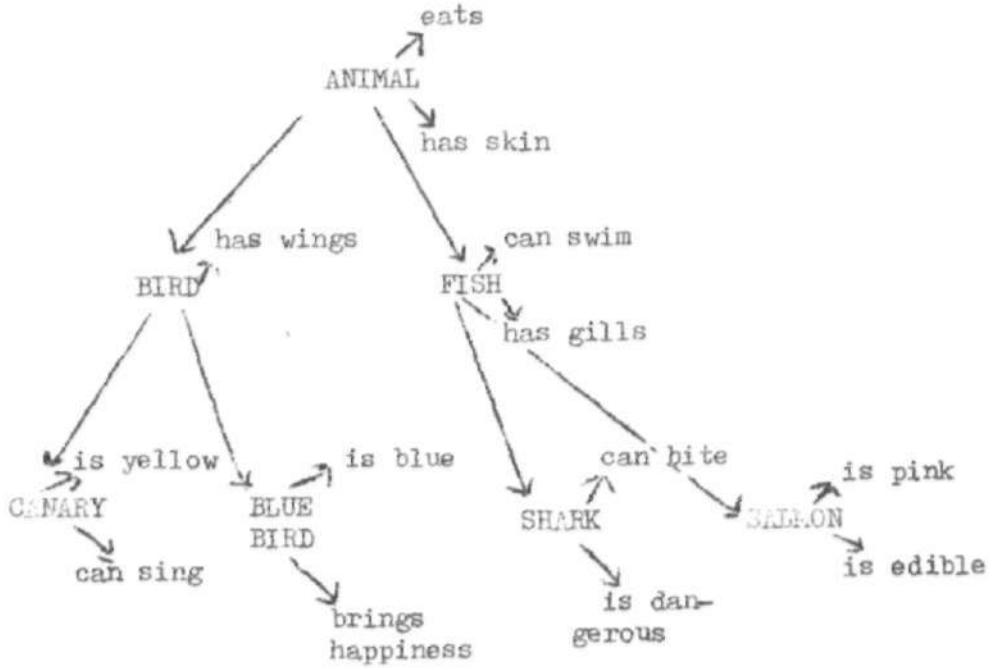


Figure 2:12 A portion of hierarchically organized memory structure. (After Collins & Quillian, 1969)

Given this hypothesized network structure, Collins and Quillian's next task was to determine how information is retrieved from the structure. To answer this question, an experiment was carried out in which subjects were asked to answer "Yes" and "No" to simple questions. Consider, for example, the following questions about canaries:

1. Does a canary eat?

2. Does a canary fly?

3. Is a canary yellow?

Referring back to the hypothesized structure (Figure 2.11) the three questions above may be characterized by the semantic level at which the information needed to answer them is stored. Consider the first question, "Does a canary eat?" The information "eats" is stored with ANIMAL two levels away from CANARY. Likewise, the information "has wings" and "is yellow" (needed to answer the second and third questions) is stored one and zero levels away from CANARY, respectively. The major data of interest in Collins and Quillian's experiment were the reaction time to respond to the questions. (Naturally, questions such as those above were intermixed with such other questions as "Does a canary have gills?" for which the correct answer is "No".)

The *cognitive economy* assumption - that a property which characterizes a particular class of things is stored only at the place in the hierachy that correspond to that class - has been questioned. Anderson and Bower (1973, p. 381) state their objection: "There is no compelling reason to believe that human memory cannot retain any redundant facts; there is no strong need for erasure or garbage collection of redundant facts just to 'clean up' the memory system".

Conrad (1972), meanwhile attacked the cognitive economy assumption on experimental grounds. Conrad simply asked subjects to describe a canary, a bird, an animal, and so on.

She then tabulated the frequency with which various properties were mentioned. It turned out that the properties frequently associated with canary (such as the fact that they are yellow) were the properties presumed by Collins and Quillian to be stored directly at the CANARY node, whereas the properties that Conrad found to be less frequent were presumed by Collins and Quillian to be stored with BIRD or with ANIMAL. It may very well be, therefore, that property frequency rather than the hierachical distance determines retrieval time. In fact, in an experiment to test for this possibility, Conrad has found that property frequency has a large effect on reaction time, whereas hierarchical distance does not.

Parenthetically, it should be noted that Conrad's disconfirmation of the cognitive economy assumption illustrates the danger of taking a physical analogy too seriously. It has been pointed out that the information-processing approach derives in large part from a computer analogy. For computer, space economy is critical because computers have a limited memory capacity. However, computers process information very fast. A computer analogy therefore suggests economy of space (that is, cognitive economy) at the expense of additional processing (that is, having to move up and down a hierarchy to find needed information). However, humans are probably somewhat different; they process information relatively slowly but appears to have virtually infinite storage capacity. So humans can probably operate more efficiently by storing information very reduntantly and thereby cutting down

on the processing time necessary to find the information. Allan Collins and Ross Quillian are expert computer programmers as well as scientists, and probably this is why the cognitive economy assumption suggested itself to them.

Following the lead of Katz and Fodor (1963), Smith et al (1974) begin with the assumption that the meaning of any item in memory can be represented as a set of semantic features in their feature-comparison model. In this sense the model resembles a set-theoretic model, but Smith and his colleagues have made a critical new assumption: that there are two distinct types of features. First, there are those features which are essential aspects of the item's meaning. These are known as <u>defining features.</u> Conversely, other features do not form part of the item's definition, but are nonetheless descriptive of the item. These are referred to as <u>characteristic features</u>. To illustrate these two kinds of features, consider the word "Robin". There are some features that must be true of robins, such as they are "living", "have feathers," "have wings," and "have red breasts". These are defining features. Other features, however, may be associated with robins, but they are not necessary to define a robin. These include features such as "like to perch in trees", "undomesticated", "harmless," and "smallish". In situations where a subject must decide whether an instance is a number of a category (for example, deciding whether a robin is a bird), it is assumed that the sets of features corresponding to the instance and the category are partitioned into the two subsets corresponding to defining and characteriatic features. Figure 2:12 illustrates this partitioning for ROBIN and for BIRD.

	Concepts	
Defining features	Robin	Bird
	Is living	Is living
	Has feathers	Has feathers
	Has wings	Has wings
	Has a red breast	
	.	.
	.	.
	.	.
Characteristic features	Flys	Flys
	Perches in trees	.
	Is undomesticated	.
	Is smallish	.
	.	
	.	
	.	

Figure 2.13 The meaning of a concept in terms of semantic features. The higher on the list a feature is, the more essential it is for defining the concept (cf Smith et al., 1974)

The process of verifying whether an instance is a member of a category (in this case, is a robin a bird?) is now assumed to be accomplished in two major stages that are schematized in the flow of figure 2.13. The first stage involves a comparison of both the defining and the characteristic features of the instance and the category to determine the degree to which the two sets of features are similar. If there is a high degree of correspondence between

the instance features and the category features, the subject responds "Yes" immediately. If the two sets of features have very little correspondence (low similarity), the subject can respond "No" immediately. If, however, there is an intermediate level of similarity between the features of the instance and the features of the category, then a second stage is needed before the subject can reach a decision.

In the second stage, the subject compares only the defining features of the instance and the category. If all the defining features of the category are also defining features of the instance, then a "Yes" response is made; otherwise the subject responds "No".

How well does this model describe the findings in the semantic memory literature? Three results shall be considered, the one of which is called the typicality effect. When a subject is asked to verify whether an instance is a member of a category, say BIRDS, subjects are consistently faster in verifying some instances (for example, ROBIN, CANARY) than other (for example, CHICKEN). The faster instances are those that are judged by other, independent subjects to be more typical of the category. The typicality effect has been observed in at least three different laboratories (Rips, Shoben and Smith, 1973; Rosch, 1973; Witkins, 1971). The feature - comparison model explains this results by assuming that if the instance to be verified is highly typical of the category, the two share a large number of features (both defining and characteristic). When it is discovered during stage I that the instance and category have

largely overlapping features, the subject can make immediate response without executing stage 2. For a typical instances, in contrast, there is not much overlap in terms of the characteristic features. Stage 2 must therefore be executed, and response time is accordingly longer. To summarize the argument, the reason typical instances are verified faster than atypical ones is that the typical instances may require only stage 1, whereas the atypical ones often require both stages 1 and 2.

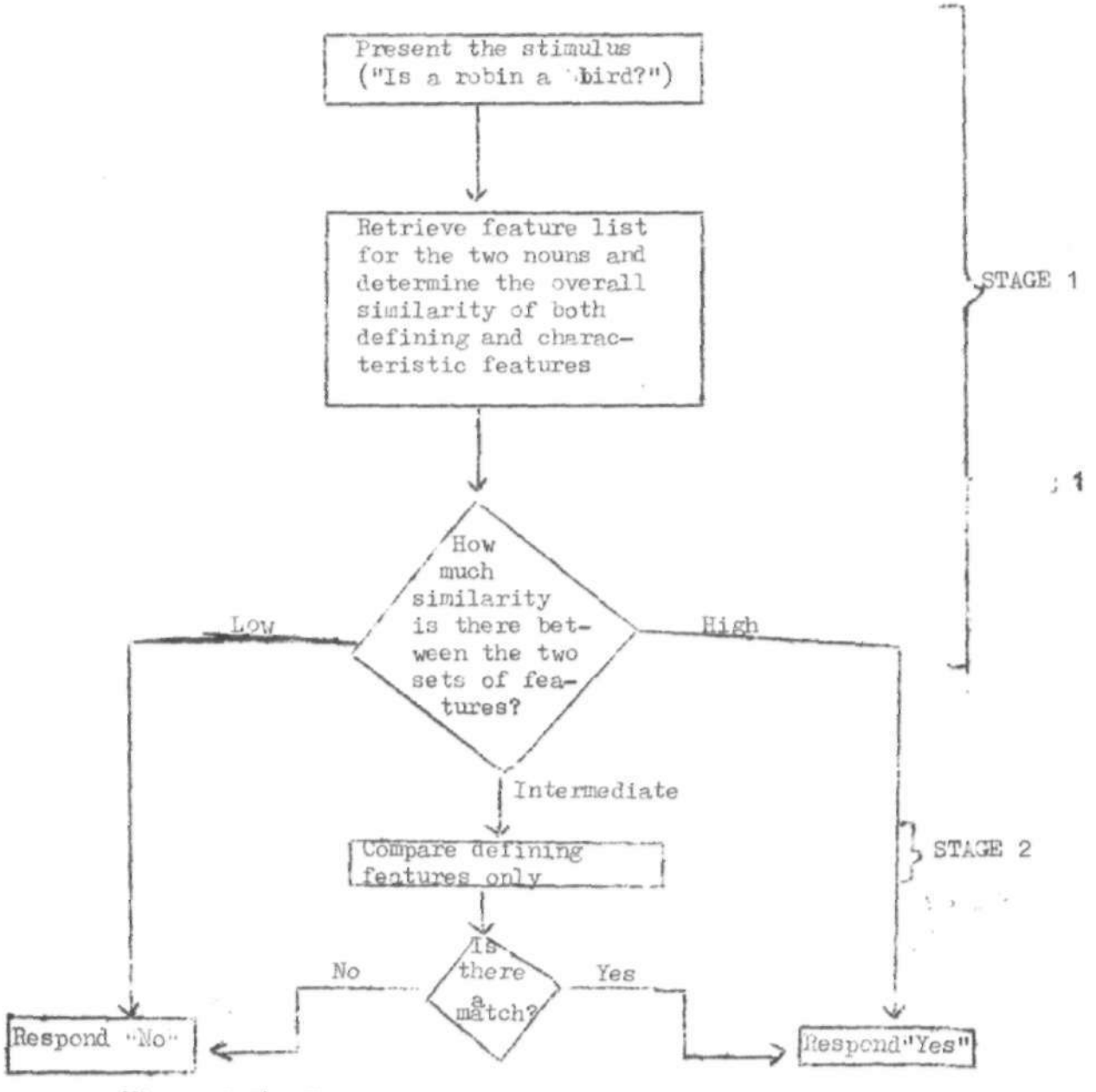


Figure 2.14 The feature comparison Model for the verification of such statements as "Is a bird a Robin?"(After Smith et al., 1974)

As appealing as the feature-comparison model is, at least two problems with it are evident. The first problem, pointed out by Collins and Loftus (1975), is that the distinction between defining and characteristic features has the inherent difficulty that there is no feature that is absolutely necessary to define something. For example, if a person removes the wing from a bird, that object does not cease to be a bird. If the feathers were plucked from a robin, it does not stop being a robin. Furthermore, people do not appear to be able to make consistent decisions as to whether a feature is defining or characteristic. Is "having four legs" a defining feature of tables? What if a person sees a table like object with only three legs? Does he still call it a table? Smith and his co-workers appear to have recognized that features are more or less defining, but they have been forced into making what is probably a somewhat artificial distinction between defining and characteristic features.

A second problem with the feature-comparison model is that it cannot explain a result observed by Glass and Holyoak (1975). To better appreciate this failure of the model, the process of deciding that something is not something else is to be considered (for example, "Is a banana a robin?"). In this example, the two nouns, "banana" and "robin", have almost zero features in common, and a subject should therefore say "No" very quickly. However, what about the question "Is a Collie a robin?" It should take somewhat longer, because the subject may determine that the two nouns have some features in common (for example, both are living) and therefore executive stage 2. The feature-comparison model

thus expects that the more related two nouns are, the longer it takes the subject to say "No". Glass and Holyoak (1975) have investigated the speed with which subjects can disconfirm various types of false statements. The result that is damaging for the feature-comparism model in that subjects can disconfirm a false statement such as "Some chairs are rocks," even though chairs and tables are similar to each other than chairs and rocks.

Most laboratory experiments of human memory have dealt with episodic memory phenomena; many few have dealt with semantic memory phenomena. It is certainly the case that many more experimental and theoretical developments are needed for a full understanding of how the semantic store is organized and how information from it is retrieved.

Another important problem for students of memory is to determine the interdependence between episodic and semantic memory. Suppose, for example, an automobile acident, which is a highly complex and sudden event often lasting a few seconds is been witnessed by a person. The knowledge contained in semantic memory influences his perception and memory for this event.

A recent experiment (E. Loftus & Zanni, 1975) demonstrated this quite clearly: college students watched films of traffic accidents and then answered questions about events occuring in the film. Some of the students were asked questions containing an indefinite article (for example, "Did you see a broken headlight?"), whereas other students were asked questions containing a definite article (for example, "Did you see the broken headlight?"). In fact, there was no broken headlight in the film. Questions containing definite

article promised many more "Yes" responses, indicating "false" recognition of events that never in fact occured.

Why does this happen? Apparently, when asked "Did you see the....?" a person familiar with the semantic rules governing the use of the "the" (a part of semantic memory) is likely to infer that the object has, in fact, been present. After, all, a person uses the definite article when he is referring to a particular object, and he uses the indefinite "a" when he refers to a member of a class of objects. Conversely, the indefinite article is not likely to lead to the inference that the object has been present. The effect illustrates something very important, nmely, that a person's semantic knowledge (in this case, his knowledge of about the use of "the" and "a") can influence his report of an event he has experienced (in this case, an accident he has witnessed). The indication is that semantic memory and episodic memory depends highly on each other.

2.4 Summary

Exploration of the memory system has been started by noting that the information from the environment is first placed into sensory store, and a number of characteristics of this store have been described.

1. Sensory store holds a large amount of information—essentially all the information impinging on a given sense organ.

2. Information in sensory store takes the form of raw, sensory patterns as yet unanalyzed for meaning. .

3. Information decays from sensory store very quickly.

4. A portion of the information in sensory store is transferred out via the process of pattern recognition.

Pattern recognition is the process of attaching meaning to a sensory pattern and probably consists of testing for the presence or absence of elementary sensory features. The decision of which information to transfer out of sensory store and which to let decay away is the phenomenon of attention.

The distinction between two types of long-term memories was initially proposed by Endel Tulving; "episodic memory" was the term he reserved to refer to memory for humans' personal experiences and their temporal relations, whereas "semantic memory" referred to individuals" knowledge of words, concepts, and relations among the two. Investigators of human semantic memory are concerned with this question: how is this type of information structured in memory, and is it retrieved? To answer this very important question, experiments are usually conducted in which subjects are observed and sometimes timed while they retrieve very simple information. The data are used to make inferences about storage and retrieval processes, and several types of models have been proposed to account for these data. Network models, set-theoretic models, and the feature comparison models are three among them.

Some of the ways in which theory and research on human information processing has been applied to real world problems have been touched and speculations as to potential future applications.

The next chapter deals with the aims and hypothesis of this study.

CHAPTER III

AIMS AND HYPOTHESES

The aims of this study were to investigate the differential effects of part - vs - whole method of presentation of a text on information processing and immediate recall and interretention of the text. It has been shown before in the previous chapter from the psychological consideration of relevant theories and models of memory mechanisms and retention behaviour of human beings how information processing and retention of information depends on the repetitive presentation of the information and the time intervals or pauses in the sequence of information presentation. The greater the repetition and the more the number of pauses during the presentation of the information, the greater is the likelihood of effective retention.

On the basis of these arguments the following null hypothesis is stated, viz,

3.1 Null Hypothesis (H_o):

There will be no significant difference among five randomly selected groups in their mean retention scores of a text presented by playing back the text with tape recorder in five different styles of presentation varying in repetition and number of pauses during presentation.

The next chapter deals with the experimental methodology of the study.

CHAPTER IV

EXPERIMENTAL METHODOLOGY

4:1 The Sample:

The subjects of the sample of the study were obtained from the parent population of first year N.C.E. students of the Advanced Teachers' College, Zaria. From a total of 307 students of the first year, the investigator randomly obtained five groups of 50 subjects ($n = 50$, each) the total sample size being 250 ($N=250$). This randomization was done in the following way, viz,

(1) The names of 307 students were listed first in a random way by shuffling the registers containing names of students of different subject combinations, for example, History - Geography, History - English, Biology - Chemistry, Biology - Mathematics, Chemistry - Physics, and so on.

(2) The subjects of the list were then given serial numbers as 001, 002, ... 009, 010, 011, ... 099, 100, 101, ... 307.

(3) Thereafter using the tables of random numbers the investigator read three digit random numbers as they were predicted by the table.

(4) The first predicted random number identified the first subject from the list for the first group, the second three digit random number identified the first subject of the second group, and so on.

This method of randomization maintain the criterion of randomness of the subjects in the group since a subject predicted from the table of random numbers had an equal chance of being selected for any one of the five groups than it would have been if the investigator had randomly selected all 50 subjects of the first group first, second group second, and so on in which case the subjects selected for a particular group had no chance of falling in any other group.

4:2 The Text

The text was selected from a text book on educational psychology (Mukherjee, 1978). This text consisted of 420 words on the psychology of motivation and is reproduced in Appendix 1 of this dissertation.

4:3 Treatment

To ensure controls in the design of this experiment the following aspects of the treatment were first decided upon, viz-

(a) The text will be presented through the auditory modality of sensation by playing back the text pre-recorded on five different cassettes, the speed of recording being 84 words per minute.

(b) The tapes should be played back at the same pitch, that is, decibals of sound, for every group.

(c) The five groups, A, B, C, D and E will receive respectively five treatments, a_1, b_1, C_1, d_1 and e_1 so that group A receives treatment a_1, group B receives treatment b_1, and so on, as shown below, viz -

Group A - Treatment a_1:

The entire text was played back first. Then there is a pause of 10 seconds. Then the entire text was played back again.

Broup B - Treatment b_1:

The text was read in instalments of two sentences. After the play back of every two sentences there was a pause of 10 seconds. Then the next two sentences were played back followed by the same pause interval, and so on. At the end of the text after the same pause interval the entire text was replayed in the same manner.

Group C - Treatment c_1:

For this group after every two sentences there was a pause of 5 seconds. Then the last previous sentence was played back followed by a pause of 10 seconds. The next two sentences was played back in the same manner till the entire text was played back when there was a pause of 10 seconds again.

The entire text was replayed in this manner for the second time.

Group D - Treatment d_1:

For this group after the first two sentences were played back there was a pause of 5 seconds then the last previous sentence was played back followed by pause of 10 seconds, and then the last two previous sentences were played back followed by another pause of 10 seconds. In this way the entire text was played back followed by another pause of 10 seconds and then entire text was played back in the same manner once again.

Group E - Treatment e_1:

This treatment was exactly the same as treatment d_1 with the exception of a summary of the text for recapitulation at the end of the entire text followed by another replay of the entire text.

3.3 Retention Test:

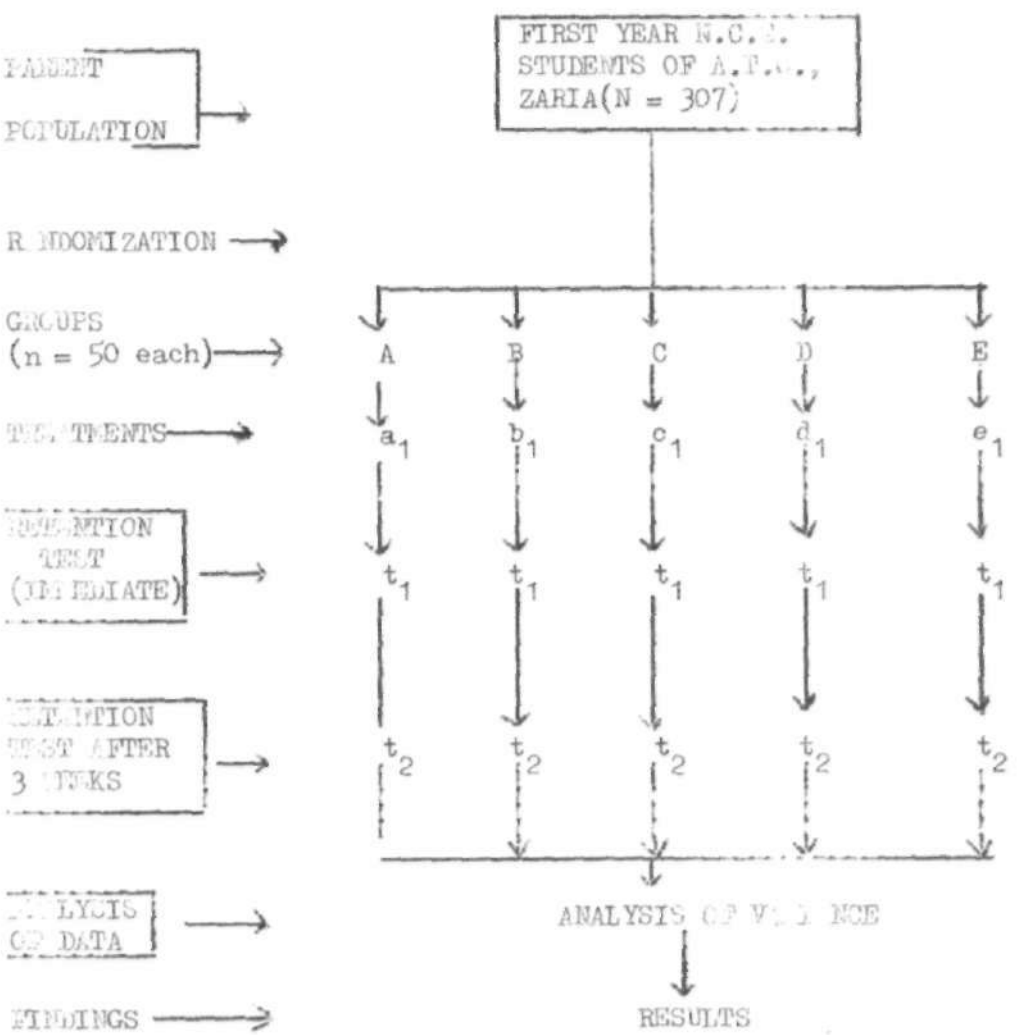
A retention test was designed by the investigator consisting of twenty items of questions covering the entire text, for which short answers were necessary. The items in the text were randomly shuffled in such a way so that the answers to the items in sequence did not follow the sequence of the arguments in the text, that is, the items at the beginning related to the end part of the text while items at the end

related to the beginning part of the text and so on. This retention test was administered twice the first one being immediately after the treatment the second one being administered after a period of three weeks.

4:5 Scoring

Correct answers were scored as 1, mistakes being ignored. The same method of scoring was adopted for later retention test as mentioned before.

4:6 Research Design



4:7 Data Matrix:

The data matrix of statistical analysis of the data consisted of two retention scores of every subject of each of the five groups and their sex affiliations.

The next chapter deals with the analysis of data and results

CHAPTER V

ANALYSIS OF DATA AND RESULTS

The data matrix on this study was subjected to statistic analysis using the University Computer with the aid of SPSS Programs. Firstly, the means, standard deviations and standard errors of both recall and retention scores of the five groups of subjects were calculated. Tables 5.1 and 5.2 show these results, viz:

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Table 5.1

Means, Standard Deviations, and Standard Errors: Criterion Recall Scores

(n = 50 each)

Group		Mean	S.D.	Standard Error
A	50	5.24	2.4207	.3423
B	50	5.10	2.0923	.2959
C	50	9.84	2.2439	.3173
D.	50	12.26	2.6788	.3788
E	50	12.98	2.2632	.3201

Table 5.2

Means, Standard Deviations, And Standard Errors: Criterion Retention Scores

(n = 50 each)

Group		Mean	S.D.	Standard Error
A	50	4.26	2.3803	.3366
B	50	5.10	2.0923	.2959
C	50	9.34	2.2371	.3164
D	50	11.90	2.7572	.3899
E	50	12.66	2.3353	.3303

It is noticed from the above tables that the mean recall and retention scores of the groups A, B, C, D and E increased in the same order as the groups are arranged, thereby showing the increasing effects in significant gains of the mean recall and retention scores with the progression of the treatments as we move from group (A) to group (E). The relative sizes of the standard errors of these mean scores for all the groups for both recall and retention tests were however almost negligible, thereby lending support to the satisfactory randomization adopted in this study.

Then the investigator wanted to examine if the mean scores of these five groups for both recall and retention tests differ significantly from one another, by applying analysis of variance statistics. Tables 5.3 and 5.4 reveal the results of these analysis, viz,

Table 5.3

Analysis of Variance: Criterion Recall By Group and by Sex

(n = 50, each)

Source	Sum of Squares	df	Mean Squares	F	P
Main Effects	2478.840	5	495.768	91.681	<0.001
Group	2478.333	4	619.583	114.577	<0.001
Sex	12.944	1	12.944	2.394	N.S
Interaction	40.181	4	10.045	1.858	N.S
Error	1297.814	240	5.408	-	-
Total	3816.836	249	15.329	-	-

Table 5.4

Analysis of Variance: Criterion Retention By Group and by Sex

(n = 50, each)

Source	Sum of Squares	df	Mean Squares	F	P
Main Effects	2963.513	5	592.703	107.707	<0.001
Group	2962.450	4	740.613	134.585	<0.001
Sex	13.849	1	13.849	2.517	N.S
Interaction	42.508	4	10.627	1.931	N.S
Error	1320.703	240	5.503	-	-
Total	4326.724	249	17.376	-	-

It is seen from the above tables that for both recall and retention scores ,

(a) the main effects, that is, all factors, for example, group and sex taken together, were significant at 0.001 level of confidence and

(b) the groups differed significantly from one another at 0.001 level of confidence.

Neither interaction nor sex as factors were found to be significant for either the recall or the retention scores.

The investigator then wanted to examine if there were significant differences between any pair of two groups for both the recall and retention scores by applying Scheffe's test analysis. The results of the Scheffe's test analysis were found to be non-significant.

Results

The results of the statistical analysis are summarized in the following:

(a) the groups differed significantly from one another in their mean recall scores (Tables - 5.1 and 5.3)

(b) the groups differed significantly from one another in their mean retention scores (Tables - 5.2 and 5.4)

On the basis of the above significant results the null hypothesis of this study was rejected and its alternative hypothesis was supported. Comments of the implications of these results will be made in the last chapter of this dissertation.

CHAPTER VI

CRITIQUE, CONCLUSIONS AND IMPLICATIONS

6.1 Critique

That the sampling technique adopted in this investigation was satisfactory is borne out by almost negligible standard errors of the means for the both immediate recall and later retention tests (Tables -5.1 and 5.2). This was achieved by adopting a random sampling technique from a parent population of 307 subjects by allocating the first randomly predicted subject to group A, the second to group B, ... the fifth to group B, the sixth to group A again and so on instead of obtaining the first 50 randomly predicted numbers indentifying subjects of group A, and the second 50 for group B, and so on. Had the investigator adopted the latter method of randomization of groups then any of the first 50 randomly predicted numbers would have had no chance of falling into any other group but group A thereby violating the underlying assumptions of random sampling. On the basis of this argument it can be safely claimed that the five different groups were equivalent in their recalling ability at the commencement of the experiment and if any significant differences were to be found in their mean immediate recall and later retention scores then they could have happened only due to the differential treatment experiences of the groups.

As regards safeguarding internal validity factors it is clear from the Tables - 5.1 and 5.2 that there was no

'experimental mortality'. The scoring of the recall and retention tests was objective and there were not any other tests to be scored by the investigator, and on this basis it can be argued that there was no bias due to 'experimenter decay'. There was further no question of any bias been introduced in the experimental results due to internal validity factors of reactive responses (recalling a meaningful prose material is not concerned with social desirability), effect of historical changes (the data collection was over within a period of three weeks when no historical changes in Nigeria took place), and maturation (the subjects were all mature adults with ages far beyond the Piagetian developmental stages). The other internal validity factor of statistical regression effect towards the mean could not have taken place since the investigator did not have any extreme groups of subjects, that is, subjects with very good or very poor recalling abilities, as the groups of subjects were randomized from the same parent population. Hence according to Campbell (1969) the investigator safeguarded all the internal validity factors of this investigation. As regards external validity, that is, representativeness of the findings to wider populations it is clearly seen that the sample sizes were large enough each being nearly 6% of the parent population, a figure adequately representative of the parent population on the ground of their satisfactory randomization, thereby lending support to the claims of the investigator that the findings of this study were representative for the parent population of this study and also similar populations with the same parameters elsewhere in

Nigeria. The representativeness of the findings is also borne out by the almost insignificant values of the standard errors of the mean for both recall and retention scores as shown in Tables - 5.1 and 5.2.

Further the investigator took additional controls in the research design by presenting the learning materials through the play back of pre-recorded cassette tapes at the same decibels of sound and at the same rate, that is, words per minute. The only difference in the treatments lay in the number and length of pauses, and repetitions and hence on this ground it can be safely held that any significant differences found in the respective mean recall and retention scores would be attributable to these treatment factors and nothing else.

6.2 Conclusions

From the above arguments the following conclusions are made from the results of the investigation, viz, -

(a) Immediate recall and later retention of meaningful prose material is almost facilitated if after the first two sentences there is a pause of five seconds followed by the repetition of the last sentence followed by a pause of ten seconds and the repetition of the last two previous sentences followed by another pause of ten seconds, before the next two sentences are played back (Group 3, Treatment e_1).

(b) The recall and retention score means of the different groups differ significantly from one another (Tables – 5.3 and 5.4), and the direction of this difference for both the recall and retention tests are evidenced from the Tables – 5.1 and 5.2 and they are in the following descending orders of magnitude for the different groups, viz – For the recall test scores, E, D, C, A and B and for the retention scores of E, D, C, B and A. The only difference in the above pattern is that group A's mean recall score is higher than B's mean recall score while B's mean retention score was higher than A's mean retention score, which have happened by chance.

(c) Sex and interaction between sex and groups as factors were not found to be significant (vide Tables – 5.3 and 5.4).

6.3 Implications

The objective to understand man as an information processing system, that is, the ability of human beings to remember past learning, their unique features to forget a considerable part of their learning and experience, has prompted the researcher to the understanding of models, theories and some research evidence in this connection. The investigator has in this regard taken up the effects of pause and repetition on the recall of prose text. Now that one has the framework one arrives

at the questions: What good is it? What exactly can we do with it? It is true that the framework is still relatively new, because of that much of its potential for practical application has yet to be realized. However, from the consideration of the above points as investigated by the researcher in connection with the psychology of pause and repetition, the following factors seem to be important in teaching and learning, the objective of which is retention and recall.

It has been found that apart from individual differences in the ability to retain past learning every individual shows some degree of mastery to reproduce his past learning or experience. For this to happen three stages of human behaviour have to be observed, viz, -

(a) there must be some initial learning experience

(b) there must be some intervening period during which learned materials or experience is stored by the individual and

(c) there is final stage of reproduction of that initially learned materials or experience.

If psychology of human memory and its findings are valid, as shown in the study, then it may be possible to reduce the negative effects of the above stage (b) to its near-zero level when past learning can be reproduced effectively later by the learners. This is one of aspect where this study has made its contribution.

Further the investigator found that the process of storing knowledge may under certain circumstances, disrupt the retention of additional bits of information. For example, it was found that response competition at the time of recall can be responsible for some retention loss or interference effect. This clearly explains the relative better performance of group A over group B. The pitch of presentation was equal for all groups, that is, at equal decibels. However, while group A had a continuous flow of information, group B had the text presented in sequence of two sentences with a pause of five seconds without repetition of the previous two sentences. This had an effect of separating the entire text into bits of information, allowing for discontinuity of information flow for group B. Hence, the recall of the first two sentences would be blocked by the second two sentences, the recall of the second two sentences would be affected by the recall of the third two sentences and so on. In compatible responses have been connected to the same response. The recall of one temporarily blocks the recall of the other. The incompatible responses compete with each other, cause confusion and lead to errors in recall. Similarly, an attempt to recall the second two sentences compel the subjects to have the first two sentences unwanted, and this may interfere with later recall after first two sentences, unless of course learning to retain is perfect as in group E. Moreover, for group B the separation of the entire text into two sentences with a pause of five seconds without repetition did not allow much time for rehearsal, and whatever rehearsal that was done it was by the subjects and not

afforded by their respective treatments and hence no continuity.

The investigator also found that a considerable part of the intervening materials from a steady flow of information is likely to be lost. It is assumed that the Long Term Memory or the Memory bank is rather a slow-coach, and it takes long time to process and store the incoming bits of relevant learning. So while the Long Term Memory is engaged in a very useful process of storing bits of information as memory traces or schemata, it has to send back some of the following bits of information to the Short Term Memory to hold on for some time. During all this, if the flow of information does not stop, which is usual in the normal classroom as the teacher is commonly engaged in showing his mastery of the subject he teaches, it would not be surprising if the individuals are able to retain only bits and pieces of information in an almost haphazard manner, missing out a lot of many essential aspects of the information. This will be particularly so, if the listeners did not keep any record, say, by note taking. That a considerable part of the intervening materials from a steady flow of information is likely to be lost, gets some further support from a consideration of the Information Theory of Shannon (1948).

For a steady flow of information, for example, a tape-recorded message or lecture, the amount of information processed, by decoding, and encoding for satisfactory storage so that it can be retrieved in future, is always less than what is received as manifested by all the treatment groups, viz, - groups A, B, C, D and E. What would happen if the flow of information did

not stop to give this much needed time for processing the information by the subjects? The results would be obvious, that is, there would be gaps in reception learning. The obvious remedy as brought about by the study is for teachers to allow pauses, which would be well-used by repetition of the already transmitted message by the way of recapitulation and revision during the same lesson hour.

Closely in this connection is the fact that there should be provision and time for recapitulation and revision of the learned or taught materials during each lesson, and in each week pupils should be encouraged to improve on their study habits, notetaking, recording and reading. Since Information Theory exposes our limitations in keeping pace with the flow of information, and in the processing of information received, care should be taken in the transmission of information by providing for gaps or pauses, and using a language of highest redundancy. This explains why group E performed best relative to groups D, C, B and A. Group E had the highest facility for rehearsal. This would have facilitated maintainance of the information in the Short Term Memory long enough for possible transfer to Long Term Memory. For items to be transferred from Short Term Store to Long Term Store they must be rehearsed (Atkinson and Shiffrin, 1971).

For teachers and educators, if memory has to be retained for long periods of time then the immediate memory has to be rehearsed over and over again till the whole learning or experience is retained for good. In other words any learning or experience for long time retention is a time consuming process. If this is so then, we as teachers must allow during our lessions enough scope to our children for repetitions, revisions, recapitulations and pauses. Without the provision of the above in any teaching lesson the lessons learned during the lesson will soon be forgotten.

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APPENDIX I

TEXT FOR TODAY

It has been shown by Harlow that well-fed monkeys solved wire-puzzles simply for the sake of curiosity. Many individuals manifest motivated behaviour without the slightest regard to the presence or absence of incentives in their undertakings. The activities themselves are self-motivating to them. Even in a Skinner box, the rats soon show a gradual decline in their slopes of operant curves in the extinction periods. It is true that animals excluding human beings can be shown to manifest higher degrees of motivation depending on greater magnitudes of rewards. There is evidence that chicks run faster in the maze for greater rewards. Very young children will probably manifest the same sort of behaviour for greater rewards. But most human beings would not show such behaviour characteristics. For example, a successful teacher will not change his job simply on a consideration that more money can be had if he went into business. The answer lies in his job satisfaction. Theories based on simple extrinsic rewards are therefore not satisfactory in explaining motivated behaviour of most human beings, either inside the classroom or outside. Further there is enough evidence that many of us would leave our undertakings if there is no job satisfaction, that is, if the activities we engage ourselves in do not give us the satisfaction we continually seek for. No amount of incentives can make us stick to those undertakings. On these considerations,

it is perhaps useful to consider Bruner's model explaining motivated behaviour. He identifies three distinct forms of intrinsic motivation: curiosity, competence and reciprocity. Curiosity satisfies the need for novelty in children's behaviour. Competence is the motive to control the environment to meet the individual's need for survival. Reciprocity is the need to behave as the situation demands. In any situation, there is no behaviour of any individual that can be held to be an isolated activity. Individuals live in groups, in families, and in societies, and these groups, families, and societies have predefined accepted goals of achievement. By bringing success to oneself, one is accepted in one's group, which is reciprocated by others in the group in their own undertakings. The last point of Bruner deserves special mention with reference to the concept of "affiliation motivation" of groups. There are groups in many societies, and there are societies in many nations, which manifest a higher degree of affiliation motivation than others. For example, it has been reported that the workers' groups in the Peoples' Republic of China, work for their common goal and not for their individual achievements.

Summary of Text

Harlow found monkeys solved wire-puzzles for curiosity. Many individuals manifest motivated behaviour without caring about any incentives. The activities themselves are self-motivating. Even the rats in the Skinner box show gradual decline

in operant behaviour during extinction periods. Animals manifest higher degrees of motivation for greater rewards. Chicks run faster in maze for greater ... food rewards. Very young children will also work harder for greater rewards. Most human beings will not do the same as animals or young children. Successful teachers will not leave their jobs for more money. The answer lies in his job satisfaction. Theories based on extrinsic rewards are not satisfactory in explaining human behaviour inside the classroom or outside. On the other hand many of us would leave our jobs if there is no job satisfaction. No amount of incentives can make us stick to those undertakings where there is no job satisfaction. Bruner's model explaining motivated is interesting in this regard. There are three aspects of his model - curiosity, competence and reciprocity. Curiosity satisfies requirements of novelty in children's activities. Competence is the motive to control the environment for the survival of the individual. Reciprocity is the need to behave as the situation demands. No behaviour of any individual can be held to be an isolated activity. Individuals live in groups, families and societyes and nations having predefined accepted goals of achievements. While one individual succeeds the glory of achievement comes to his group and is taken as the achievement for the entire group. This last point of Bruner's model refers to affiliation motivation of groups. Many groups in many societies in many nations manifest a higher degree of affiliation motivation than others. The worker's groups in the People's Republic of China work for their common goal and not for their individual glory.

APPENDIX II

QUESTIONNAIRE

The questions are strictly based on the text you are going to listen to from the tape recorder. The researcher wants to use the answers to these questions to be able to know what help people to have retention hence to measure retention amount.

It should be clear that this is not an intelligence test nor any form of examination.

The researcher does not want your name but only your sex and age. All answers, therefore, must be given in confidence and to the best of your knowledge of the text.

Instructions:-

1. Answer all questions
2. Time allowed is twenty minutes
3. One minute for each question
4. You must not leave any question blank
5. If you finish before time leave the question/answer paper on/by your seat.

A. Sex: _____

B. Age: _____

1. What animals would manifest greater motivation for larger rewards? _____

2. What is meant by 'self-motivating' activities. _____

3. Why do some people leave their under-takings even if they are given all necessary incentives? _____

4. What proof do we have that some animals run for greater rewards? _____

5. What did Harlow find? _____

6. How does the presence of rewards help explain human behaviour? _____

7. Why the theories of motivation based on extrinsic rewards are not as satisfying as those based on intrinsic factors? _____

8. What are the three forms of intrinsic motivation according to Bruner? _____

9. What is Bruner's model in explaining motivated behaviour? _____

10. Why do some individuals not leave their undertakings even for greater rewards? _____ _____

11. What controls human behaviour in a group? _____

12. What does Bruner wants us to understand by the concept 'reciprocity'? _ _____

13. What effect does success have on one in a group. _____

14. Why is it that behaviour of individuals cannot be held as an isolated activity? _____

15. What does the concept "competence" mean in Bruner's model? _____

16. What factors help the individual to internalize the predefined goals of his group? _____

17. In what ways do Bruner's concept of "reciprocity" is related to affiliation motivation? _____

18. What do you understand by Bruner's concept of "curiosity"? _____

19. What example has been given by Bruner to illustrate his concept of affiliation motivation? _____

20. What effect does success of one in a group have on other members of the group? _____

Thank you for your cooperation.

APPENDIX III

DATA MATRIX

Group	Ss	Sex Male=1 Female=2	Age in Years	Retention Score	Retention Score After 3 Weeks
A	1	1	27	9	8
	2	1	19	5	4
Two Listening	3	1	23	4	3
Sessions:	4	1	21	5	4
	5	1	26	7	6
Text Played Back	6	1	25	0	0
Twice	7	1	38	2	1
	8	1	24	3	2
	9	1	27	1	0
	10	1	23	4	3
	11	1	23	4	3
	12	1	27	5	4
	13	1	26	2	1
	14	2	25	7	6
	15	1	28	4	3
	16	1	23	6	5
	17	2	22	8	7
	18	2	21	9	8
	19	1	23	6	5
	20	1	24	3	2
	21	1	21	3	2

Group	Ss	Sex Male= 1 Female=2	Age in Years	Retention Score	Retention Score after 3 Weeks
	22	1	25	3	2
	23	1	30	4	3
	24	2	26	7	6
	25	1	26	6	5
	26	2	22	8	7
	27	1	26	5	4
	28	2	24	10	9
	29	1	23	5	4
	30	1	22	7	6
	31	2	19	8	7
	32	1	21	4	3
	33	2	22	2	1
	34	1	25	8	7
	35	2	22	2	1
	36	1	24	4	3
	37	1	25	3	2
	38	2	22	4	3
	39	1	23	5	4
	40	1	23	7	6
	41	1	23	7	6
	42	1	27	5	4
	43	2	23	8	7
	44	2	21	8	7

Group	Ss	Sex Male = 1 Female=2	Age in Years	Retention Score	Retention Score after 3 Weeks
	45	1	32	2	1
	46	1	25	6	5
	47	1	22	6	5
	48	1	26	8	7
	49	1	26	2	1
	50	2	20	8	7
D					
Two Listening Sessions: Two Play-Backs with 10" Pause After Every Two Sentences	1	1	20	7	6
	2	2	23	6	5
	3	2	25	10	9
	4	2	22	8	7
	5	1	26	8	7
	6	2	28	7	6
	7	1	22	7	6
	8	2	25	9	8
	9	2	25	4	3
	10	1	25	9	8
	11	1	24	6	5
	12	1	21	7	6
	13	1	23	6	5
	14	1	24	4	3
	15	1	22	1	0
	16	2	23	5	4

Group	Ss	Sex Male = 1 Female=2	Age in Years	Retention Score	Retention Score after 3 Weeks
	17	2	23	3	2
	18	1	22	9	8
	19	1	23	7	6
	20	1	25	7	6
	21	2	24	6	5
	22	1	24	5	4
	23	2	20	7	6
	24	1	26	3	2
	25	1	21	6	5
	26	1	22	7	6
	27	1	25	7	6
	28	1	25	3	2
	29	1	24	5	4
	30	1	22	3	2
	31	1	22	6	5
	32	2	25	6	5
	33	2	26	9	8
	34	1	24	6	5
	35	2	24	8	7
	36	2	37	2	1
	37	2	22	6	5
	38	1	25	8	7
	39	2	23	6	5
	40	1	23	5	4
	41	1	26	5	4

Group	Ss	Sex male = 1 Female = 2	Age in Years	Retention Score	Retention Score after 3 Weeks
	42	1	22	8	7
	43	1	25	7	6
	44	1	25	1	0
	45	1	22	8	7
	46	1	22	6	5
	47	1	23	7	6
	48	1	23	6	5
	49	1	24	4	4
	50	2	25	9	8
Two Listening Sessions: Two Play Backs Pause of 10" After Every Two Sentences Then Recap of Last Sentence Followed By Pause of 10"	1	1	20	10	10
	2	2	19	15	14
	3	1	24	9	9
	4	1	26	11	10
	5	1	23	11	11
	6	1	25	12	11
	7	1	26	13	13
	8	1	20	10	9
	9	1	24	9	9
	10	1	25	10	9
	11	1	20	7	7
	12	1	24	12	11
	13	1	22	10	10

Group	Ss	Sex Male = 1 Female=2	Age in Years	Retention Score	Retention Score after 3 Weeks
	14	1	21	10	9
	15	1	19	10	10
	16	1	24	10	9
	17	1	20	9	9
	18	2	19	13	12
	19	1	21	11	11
	20	2	22	7	6
	21	1	22	8	8
	22	2	24	10	9
	23	1	24	8	8
	24	1	24	8	7
	25	1	23	10	10
	26	1	25	11	10
	27	1	26	12	12
	28	1	24	10	9
	29	2	18	11	11
	30	1	35	10	9
	31	1	26	10	10
	32	1	27	11	10
	33	1	30	10	10
	34	1	24	2	1
	35	1	25	12	11
	36	1	22	10	10
	37	1	22	12	11

Group	Ss	Sex Male = 1 Female=2	Age in Years	Retention Score	Retention Score after 3 Weeks
	38	2	25	10	10
	39	2	21	7	6
	40	1	25	10	10
	41	2	20	11	10
	42	1	23	6	6
	43	1	23	9	6
	44	2	25	12	12
	45	1	20	10	9
	46	2	18	9	9
	47	2	21	3	2
	48	2	21	11	11
	49	1	21	10	9
	50	1	24	10	10

Group	Ss	Sex Male = 1 Female=2	Age in Years	Retention Score	Retention Score after 3 Weeks
1	1	1	22	10	10
Two Listening Sessions: Two Playbacks Pause of 10" After Every Two Sentences Then Last Two Sentences Played Back Again Followed by 10" Pause	2	1	20	14	14
	3	2	24	15	14
	4	1	22	12	12
	5	1	25	10	10
	6	2	27	9	8
	7	1	23	15	15
	8	1	24	15	15
	9	1	23	9	8
	10	2	21	14	14
	11	1	25	12	12
	12	2	21	12	11
	13	1	25	14	14
	14	2	22	15	15
	15	1	27	10	9
	16	1	20	13	13
	17	2	19	13	13
	18	2	24	14	13
	19	1	26	16	16
	20	1	22	9	9
	21	1	22	9	8
	22	2	24	13	13
	23	2	23	2	2

Group	Ss	Sex Male = 1 Female=2	Age in Years	Retention Score	Retension Score after 3 Weeks
	24	1	24	14	13
	25	1	22	13	13
	26	1	24	12	12
	27	1	20	13	12
	28	2	19	14	14
	29	1	25	15	15
	30	1	21	5	4
	31	1	27	10	10
	32	1	24	12	12
	33	1	25	13	12
	34	1	23	12	12
	35	1	26	15	15
	36	1	20	11	10
	37	1	31	12	12
	38	1	23	13	13
	39	1	20	15	14
	40	1	24	11	11
	41	1	28	12	12
	42	1	23	13	12
	43	2	22	13	13
	44	2	22	13	13
	45	1	20	13	12
	46	1	23	14	14

Group	Ss	Sex Male = 1 Female=2	Age in Years	Retention Score	Retention Score after 3 Weeks
	47	1	25	13	13
	48	1	22	16	15
	49	2	18	8	8
	50	1	22	13	13
E. Same As D But With Recap of the Entire Text after 10" Pause Once Again	1	1	30	9	9
	2	2	20	14	14
	3	1	25	13	12
	4	1	28	12	12
	5	1	25	14	14
	6	1	26	15	14
	7	2	23	13	13
	8	1	30	9	9
	9	1	26	13	12
	10	1	24	15	15
	11	1	28	13	13
	12	1	22	13	12
	13	1	26	16	16
	14	2	20	15	15
	15	1	27	9	8
	16	1	23	15	15
	17	1	23	10	10
	18	1	22	15	14
	19	1	23	14	14

Group	Ss	Sex Male = 1 Female=2	Age in Years	Retention Score	Retention Score after 3 weeks
	20	1	22	11	11
	21	1	22	13	12
	22	1	23	14	14
	23	1	31	7	7
	24	1	22	12	11
	25	1	24	13	13
	26	1	25	13	13
	27	1	25	15	14
	28	1	23	14	14
	29	2	28	13	13
	30	1	24	13	12
	31	1	22	14	14
	32	1	23	10	10
	33	1	23	12	11
	34	2	24	15	15
	35	1	23	16	16
	36	1	23	8	7
	37	1	30	13	13
	38	1	23	15	15
	39	1	25	13	12
	40	2	25	14	14

Group	Ss	Sex Male = 1 Female=2	Age in Years	Retention Score	Retention Score after 3 Weeks
	41	1	33	13	13
	42	1	23	12	11
	43	1	24	14	14
	44	1	27	15	15
	45	1	30	13	12
	46	2	20	15	15
	47	2	20	7	7
	48	1	23	16	15
	49	1	24	15	15
	50	1	24	14	14