INITIAL AND DELAYED RETENTION OF RELEVANT AND INCIDENTAL INFORMATION FROM A PROSE PASSAGE PRESENTED AURALLY TO TRAINABLE MENTAL RETARDATES

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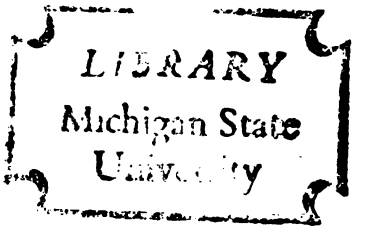

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SUE A. WISENBERG

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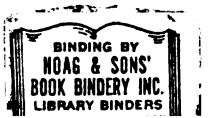

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ABSTRACT

INITIAL AND DELAYED RETENTION OF
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By

Sue A. Wisenberg

This study was conducted in order to investigate the facilitation of immediate and delayed recall of factual information from prose materials presented aurally to trainable mental retardates. Trainable mentally retarded individuals receive most of their verbal information by auditory means due to their inability to read. Therefore, an investigation of methods designed to facilitate the retention of prose materials presented aurally to trainable mental retardates could contribute useful information for the instruction of these children. It was also assumed that this kind of investigation could lend itself to an existing theory concerning the learning processes of trainable mentally retarded children. Furthermore, it was assumed that such studies would disclose some of the

variables which influence the recall of factual information of aurally presented prose materials.

Seventy-two trainable mentally retarded students were individually read a 10-paragraph prose passage via one of six presentation methods which manipulated the location of adjunct questions and a procedure designed to gain the attention of the retarded Ss. These manipulations were based upon the inspection behavior theory of Rothkopf (1963, 1965) and the attention theory of retardate learning (House and Zeaman, 1960; Zeaman and House, 1963). The same 30-item criterion test was administered to each S immediately following each of the three readings of the prose passage. The criterion test consisted of 15 three-foil multiple choice relevant questions and 15 three-foil multiple choice incidental questions. The relevant questions pertained to information in the passage to which the S's attention had been directed by means of a special procedure and were identical to adjunct questions which some Ss heard during the reading of the passage. The S's attention was not directed toward the information in the passage which answered the incidental questions and these questions were not heard by any S during passage presentation. Immediate, 100 per cent reinforcement in the form of M & M candies was used for all Ss during the first three administrations of the criterion test. A measure of delayed

retention was also obtained one week following the three initial administrations of the passage and criterion tests. No reinforcement was administered during the delayed retention segment of the study.

Analysis of covariance was used to analyze the 2 × 3 × 5 × 2 factorial design with repeated measures on the last two factors. The first factor, cueing, consisted of two levels--no cueing and cueing. The second factor was question location and consisted of three levels--no questions, questions after each paragraph, and questions before each paragraph. The third factor represented the five administrations of the same criterion test. The fourth factor assessed two types of information, relevant and incidental. The covariable was the total number of correct answers to questions immediately following the reading of each of three short pre-passages. The dependent variable was the number of correct relevant and incidental questions for each administration of the criterion test.

The repeated measures analysis of covariance and subsequent post hoc investigations indicated that trainable mentally retarded Ss presented with an aural prose learning task via a procedure designed to gain attention and/or adjunct questions did not benefit from any of the six presentation methods. Furthermore, these Ss were not facilitated in the retention of factual information via the procedure designed to gain attention or adjunct questions,

regardless of location. The trainable mentally retarded Ss did retain relevant information better than incidental information. And finally, these Ss retained as much relevant and/or incidental information one week following the original presentations as they did immediately following the original presentations.

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By

Sue A. Wisenberg

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TABLE OF CONTENTS

APPENDIX Page

LIST OF TABLES

TABLE Page

LIST OF FIGURES

CHAPTER I

THE PROBLEM

The school setting is one in which information to be learned and retained is administered through written instruction, auditory instruction and various combinations of the two. Until recently, investigators paid little attention to written instruction. However, the last decade of research in verbal learning has evidenced an increased concern with written prose learning. The general characteristic of these prose studies has been the facilitation of the recall of factual information. Various presentation methods have been used in an attempt to find variables which facilitate the recall of factual information in written prose.

Those variables which have facilitated the recall of factual information in written prose materials presented to normal subjects might also be expected to facilitate the recall of factual information in prose materials presented aurally to mentally retarded subjects. This distinction between written instruction of the normal student and oral instruction of the retarded student is of major importance. Both

written and oral means of instruction are used for the normal student. However, the majority of non-deaf mentally retarded children obtain most of their verbal information through the auditory channel. This is due to difficulties they encounter in learning to read. Furthermore, almost all trainable mentally retarded children receive their entire verbal instruction by means of some type of aural presentation. This is due to the trainable mental retardate's increased inability to read in comparison to educable mentally retarded children.

Most educable mentally retarded children can read at primary reading levels and some of them can read at a third and fourth grade reading level. However, most trainable mentally retarded children cannot read. They encounter difficulties at the earliest reading stages, such as letter discrimination and word recognition. Therefore, auditory instruction is the primary means for the administration of information to be learned and retained by the trainable mentally retarded.

Aural presentation methods of prose materials are important to the trainable mentally retarded since they rely upon the aural reception of the verbal information. However, little information is available concerning optimal methods of presenting auditory prose

to these children. Investigation of various aural presentation methods designed to facilitate the recall of factual information in prose materials would contribute useful information for the instruction of trainable mentally retarded children. Such studies could possibly provide suggestions for facilitating the aural recall of factual information by these children. In addition, this kind of investigation could lend itself to an existing theory concerning the learning processes of such children. And furthermore, such studies would disclose some of the variables which influence the recall of factual information of aurally presented prose materials.

Purpose

The purpose of this study is to investigate the facilitation of immediate and delayed recall of factual information from prose material presented aurally to trainable mental retardates. Various presentation methods will be used in an attempt to facilitate aural recall and, thereby, provide guidelines for enhancing recall of factual information of aurally presented material.

Some of the presentation methods will be based upon the attention theory of retardate learning as proposed by Zeaman and House (1963). As such, these methods will manipulate a signal designed to gain the attention of the subject during the aural presentation of the prose material.

Other methods will be based upon the inspection behavior theory of Rothkopf (1963, 1965). This theory has been investigated in studies of the facilitation of the recall of factual information from written prose. Influential variables found to facilitate recall in written prose studies will be manipulated in the present study. This will be done in order to ascertain if the same variables facilitate the recall of factual information in prose material presented aurally.

In addition, both of the above mentioned theories will be used as a basis for still other presentation methods. These methods will manipulate various combinations of a signal designed to gain the attention of the subject and influential variables found to facilitate the recall of factual information from written prose.

Finally, the present study will investigate the assumption that the mentally retarded benefit from repetition. This assumption is put into daily practice by teachers of the mentally retarded and is continuously employed in research paradigms concerning the learning of the mental retardate. Both educators and researchers give multi-presentations of the learning material to retarded subjects. The basis for this methodological procedure would seem to be that mental retardates perform in an incremental fashion when engaged in a learning process.

Theory

Two theoretical positions form the basis for the development of this study. Both of these positions are based upon different learning tasks than those employed in this investigation. However, both theoretical positions are applicable to the purpose of this study.

The first of these two theoretical positions is the attention theory of retardate learning as proposed by Zeaman and House (1963) and House and Zeaman (1960). It was derived from investigations in two-choice, simultaneous, visual discrimination learning tasks using normals and mental retardates as subjects. House and Zeaman (1960) and Zeaman and House (1963) concluded that the deficit of retardates as compared to normals was an attention deficit. Until the attention of the retarded subjects was focused on the relevant characteristics of the learning material, retardates made more errors than normal subjects. When the retarded subjects began to pay attention to the relevant characteristics of the learning material, the learning of the normal and retarded subjects was comparable. Therefore, retardates did not suffer from a learning deficit but, instead, a deficit in the ability to attend to relevant characteristics of the learning materials.

This would suggest that retardates must first learn to attend to the relevant characteristics of the material to be learned before

learning of the material can occur. Attempts to direct the attention of retarded subjects to the relevant characteristics of the learning material would, hopefully, decrease their attention deficit and, thereby, facilitate their learning of the material. In fact, Zeaman and House (1963) suggest ways of engineering the attention of retardates in order to draw their attention to the relevant characteristics of the learning material. These suggestions are made as an attempt to overcome the attention deficit of retarded subjects in two-choice, visual, discrimination learning tasks.

It is plausible to suggest that the attention of retarded subjects could also be engineered in a prose learning task which involves aural presentation of the material to be learned. Such a method would direct the attention of the retardate to the relevant characteristics of the learning material. This would, hopefully, aid the retardate in reduction of an attention deficit and might facilitate his learning of the material.

The second theoretical position used as a basis for this study is the inspection behavior theory of Rothkopf (1963, 1965). Rothkopf (1963, 1965) presents a conceptual model of learning from written sentences in which he proposes three classes of inspection behaviors. These behaviors are defined as those activities which subjects engage in during reading.

According to Rothkopf (1963, 1965) there are two categories of stimuli in learning from written materials. The first category consists of stimulus objects of a physical nature. Stimulus objects are the printed symbols to which subjects are exposed. In other words, stimulus objects are any part of the written material presented to the subject. The second category consists of effective stimuli of a psychological nature. Effective stimuli refer to the psychological consequences of being exposed to the stimulus objects.

The formation of associations between the stimulus and response components of a sentence are necessary in order for learning to occur. Rothkopf (1963, 1965) proposes that the formation of these associations depends upon the character of effective stimulation. Furthermore, the character of effective stimulation depends upon the activities subjects engage in during reading. As mentioned before, Rothkopf (1963, 1965) calls these activities "inspection behaviors." He proposes three classes of inspection behaviors, of which "mathemagenic" behavior is one. The term mathemagenic "is derived from the Greek roots mathema (that which is learned) and gignesthai (to be born)" (Rothkopf, 1965, p. 199).

Therefore, mathemagenic behaviors are activities subjects engage in which produce learning during the reading process. Rothkopf (1965) suggests that mathemagenic behaviors can be induced

and brought under control by "test-like events" or questions interspersed within the reading passage. He presents the results of an unpublished paper which verify his suggestion. Results of later research (Rothkopf, 1966) also indicate that when students are questioned over material just read, their recall of the factual information is facilitated if questions have been interspersed within the reading passage.

It is plausible that the benefits to be gained from the use of questions in learning from prose materials are not confined to written prose. Questions interspersed within a prose passage presented aurally may also facilitate the recall of factual information.

Hypotheses

Based upon research to be reviewed in the next chapter, it is expected that the use of questions in the auditory presentation of prose materials to trainable mentally retarded subjects will yield results similar to those obtained in studies of written prose materials presented to normal subjects. It is also expected that the use of a signal during auditory presentation of prose material will direct the attention of the trainable mental retardate to the relevant sentence within the passage.

It is hypothesized that questions located within the passage will facilitate the immediate recall of factual information relevant

to the interspersed questions. It is also hypothesized that a particular location of questions within the passage will facilitate the immediate recall of factual information which is not relevant to those questions. It is further hypothesized that the same particular location of questions will facilitate the delayed recall of factual information relevant to those questions. Furthermore, it is hypothesized that a signal designed to gain attention will facilitate the immediate recall of factual information found in each sentence which follows the signal.

CHAPTER II

REVIEW OF THE LITERATURE

The comprehension of prose materials presented aurally to trainable mentally retarded subjects might be facilitated by devising appropriate methods for presentation of the materials. These methods could take into account manipulation of the attention of the trainable mental retardate and influential variables in the learning of prose materials. Repetition of prose material presented to trainable mentally retarded subjects may or may not be of importance in facilitating their recall of such materials.

Attention as a factor affecting learning by the mentally retarded

Attention is of the utmost importance to mental retardates in a learning situation. McCarthy and Scheerenberger (1966) present a discussion of attention as a factor affecting the learning of the mentally retarded in a ten-year review of applied and basic research applicable to the classroom of the mentally retarded. Their discussion centers around the attention theory of Zeaman and House (1963).

The attention theory of Zeaman and House (1963) and House and Zeaman (1960) grew out of two-choice, simultaneous, visual discrimination learning problems presented to normals and trainable mental retardates. Typically, the stimuli, "junk objects" or colored geometric forms, were presented to one subject at a time on a modified Wisconsin General Test Apparatus. Candy was found under the correct stimulus. The general finding was that normals made significantly fewer errors than the trainables.

When backward learning curves were constructed, an ogival shaped learning curve resulted. This type of learning curve was initially flat at chance level and increased sharply near the criterion. Zeaman and House (1963) found that the initial flat part of the curve varied with IQ while the final approaches to criterion were the same for both groups. Slow learners were found to remain at chance level for a longer period than normals but moved quickly toward criterion when their performance began to improve. According to Zeaman and House, the dimensional aspects of the stimuli elicit attentional responses which then elicit specific cues leading to the eventual elicitation of instrumental responses. It was felt that the initial flat chance section of the curve was controlled by an attention process and the sharp increase was due to the learning of the correct instrumental response. Therefore, Zeaman and House concluded that the

retardate deficit in discrimination learning was not due to an inability to learn. Instead, the retardate learning deficit was due to an inability to direct and maintain attention to relevant stimulus dimensions. The difference between the fast and slow learners was considered to be the number of trials for learning to begin.

House and Zeaman (1960) proposed that the attention of the mental retardate could be engineered or directed toward relevant stimulus dimensions. Zeaman and House (1963) presented specific suggestions for drawing the attention of retardates to the relevant stimulus dimensions. Some of these suggestions were the use of novelty, three-dimensional stimulus objects and large stimulus cues. Although these suggestions were for visual discrimination tasks, specifically, the concept of engineering the attention of the retardate may profitably be extended to other learning tasks. The comprehension of prose materials presented aurally to retardates is a learning task which lends itself to such an extension. Presentation methods can be devised to direct the attention of the retardates to relevant sentences within the passage. These sentences would contain the necessary information to correctly answer a question concerning the passage.

Influential variables in written prose learning studies

Most prose learning studies have used normal subjects, the majority of which have been college students or adults. Furthermore, such studies have concentrated on written prose materials. These studies have been consistent in their findings and the identification of influential variables which facilitate learning of written prose. Three of these variables are question location, question pacing, and question mode. These variables may also be influential in the facilitation of the comprehension of prose materials presented aurally to trainable mental retardates.

Question location. --Rothkopf (1966) was the first to manipulate the location of questions within a written prose passage. His interest in the manipulation of this variable was based upon earlier conceptions (Rothkopf, 1963) that "test-like" events could induce and control mathemagenic behavior. Adjunct questions and instructions were thought of as "test-like" events. Rothkopf (1966) individually presented college subjects with a 5200-word written prose passage divided into seven sections. Thirty-nine short answer questions were devised. Two questions from each section were used as experimental questions (EQs) during reading and for the experimental question relevant test (EQRT). The other 25 questions were used for the general test (GT). Four treatment groups differed in whether

the EQs came before or after each section, with or without knowledge of results. A fifth treatment group (LBA) received all 14 EQs and their appropriate answers before reading the passage. A control group (C) received no EQs or knowledge of results and were told to remember as much as they could. A direction reference group (DRG) received no EQs or knowledge of results and were told to read carefully and slowly for factual information. Each subject, except those in the transfer evaluation group, was administered the general test followed by the EQRT. The transfer evaluation group took the general test, studied the EQs with knowledge of results and when perfect, took another form of the general test. No specific transfer from EQs to the general test was found for the transfer evaluation group. The results on the EQRT scores indicated that all groups having EQs did better than the control group or the direction reference group. Neither of the latter two groups received EQs. Also, the groups receiving knowledge of results, regardless of question location, did better than the groups not receiving knowledge of results. Furthermore, there were no differences in EQRT scores due to location of EQs in the text. And finally, the direction reference group received significantly higher EQRT scores than the control group. The results for the general test (GT) scores indicated that only the direction reference group and the group receiving post-questions without

knowledge of results did better than the control group. Pre-question groups did not evidence general facilitative effects.

Rothkopf and Bisbicos (1967) further explored mathemagenic behavior concepts by using restricted categories of questions in the text and increasing the number of pre- and post-experimental questions. High school subjects were given a 9000-word written prose passage concerning animals and minerals in the ocean. This passage was divided into 12 three-page zones. Two short-answer questions for each of four restricted categories were devised for each three-page zone. The four restricted categories were common phrases (C), technical phrases (T), measures of size, date, distance (M), and names (N). Four short-answer questions, one per category, from each zone were used as EQs during reading. The other four short-answer questions, one per category, were used for the criterion test. Thus, the study was measuring the recall of incidental information. All subjects in six treatment conditions were given two EQs per three-page zone which differed in type and location. The EQs dealt with names and measures (NM), common phrases and technical phrases (CT), and a mixture of all four restricted category types (MX). The EQs were located either before or after each three-page zone. A seventh treatment condition was a control group which received no EQs during reading of the passage. The results showed that subjects

who received post-questions in each of the restricted category groups (NM, CT, and MX) produced significantly higher criterion test scores than the control group. There were no differences between any of the pre-question restricted category groups and the control group. Also, there were significant differences in favor of post-questions as opposed to pre-questions for the mixture (MX) and name-measure (NM) restricted category groups. This result was not found for the common-technical phrase (CT) group. Furthermore, the facilitative effect of post-questions was found to be better for the second half of the prose passage than for the first half. To summarize, the results indicated that post-questions had a general facilitative effect when restricted categories of questions were used and that the frequent use of post-questions shaped inspection behavior.

Question location has been included as one of several independent variables under investigation in each of three separate studies by Frase (1967, 1968a, 1968b). These studies will be reviewed in the next subsection since they have been primarily concerned with the variable of question pacing. However, it should be noted at this point that the findings of Rothkopf and Frase related to question location are in agreement and disagreement. Both authors have found post-questions to facilitate the retention of incidental information. In terms of the facilitation of the retention of information

Rothkopf (1966) finds both pre- and post-question groups to retain more relevant information than a control group. But, he finds no difference between pre- and post-question groups in retention of relevant information. Whereas, Frase (1967, 1968a, 1968b) finds post-question groups to retain more relevant information than pre-question groups. These consistent and inconsistent results have been found when the length and content of material as well as response mode have differed in the investigations of Rothkopf and Frase.

Question pacing. --The investigation of question pacing and the interaction of this variable with question location and the type of retention items has been a major concern of Frase (1967, 1968a, 1968b). Question pacing refers to the frequency of questions to which subjects have been exposed during reading. Frase has been interested in the effect of this variable on subsequent retention of information and the effect of this variable on the location of questions.

Frase (1967) presented 12 groups of college subjects with written prose material which differed in passage length, question location, and whether or not knowledge of results was given. Questions were paced every 10, 20, or 40 lines within the passage. Questions (EQs) were located either before or after each of these designated passage lengths. A biographical prose passage of 20 ten-line paragraphs was used. Two multiple-choice factual questions

were devised for each paragraph. One concerned information found in the first part of the paragraph and the other concerned information found in the second part of the paragraph. The questions relating to the second part of each paragraph were used as EQs during reading and on the retention test. The other 20 questions were used to measure incidental information on the retention test. Each subject took the retention test immediately after reading the prose passage. In terms of relevant information, it was found that post-questions were more facilitative than pre-questions. Also, the 20-line passage was found to have the most facilitative effect on relevant information. In addition, the presence of knowledge of results was more facilitative than no knowledge of results. Finally, a significant interaction of question location and knowledge of results was found for relevant information. This result indicated that no differences existed between post-question and pre-question groups when knowledge of results was given. However, post-questions were more effective than pre-questions when no knowledge of results was given. In terms of incidental information, it was found that post-questions were more facilitative than pre-questions. There were no differences for the main effects of passage length or knowledge of results on the facilitation of incidental information.

Frase (1968a) included question pacing, question location, retention items, and blocks in a four-factor design with repeated measures on the last two factors. Questions were paced every 10 or 20 sentences and were located before or after each pacing segment. Retention items consisted of relevant and incidental information. Four blocks of five paragraphs each were used in order to ascertain if post-questions entail a learning to learn phenomenon or elicit a previously acquired general problem solving skill. College subjects were given the same written prose passage as in the previous study by Frase (1967). The passage was administered under the various conditions designated by the $2 \times 2 \times 2 \times 4$ design. No knowledge of results was given and upon immediate completion of the reading material all subjects were given a multiple-choice test of 40 items. Twenty of these items had been used as EQs during reading and were designated as relevant retention items. The other 20 items had not been seen by the subjects during reading and were designated as incidental retention items. Frase found that post-question groups retained both relevant and incidental information better than pre-question groups. Furthermore, relevant information was better retained than incidental information for pre- and post-question groups. A significant Question Location $\times$ Question Pacing interaction was found which evidenced an opposite effect of pacing for pre- and

post-question groups. Questions with every paragraph were found to be advantageous for post-question groups whereas questions with every other paragraph were advantageous for pre-question groups. Finally, a significant main effect for blocks was found but the interaction of Blocks × Question Location was not significant. These results indicated that pre- and post-question groups were affected in the same way across blocks. Frase then plotted the percentage of subjects in post-question groups who passed items not passed by pre-question groups. This was done for those groups who received questions with every paragraph. He found 10 to 40 per cent of the post-question groups above the pre-question groups on each paragraph except the seventeenth. He concluded that post-question groups were consistently above pre-question groups when frequent questioning was used. Furthermore, Frase concluded that the facilitation effect of post-questions was not acquired during the reading task but was due to the fact that they reinforce and maintain a previously acquired general problem solving skill.

Frase (1968b) further explored the variable of question pacing in a five-factor design with repeated measures on the last factor. The five factors were question location, question pacing, content location of question relevant material, question mode, and retention items. College students were used as subjects and were

administered the same 2000 word written prose passage as used previously by Frase (1967, 1968a). In this experiment the EQs were paced before or after every 10, 20, 40, or 50 sentences. Multiple-choice questions and constructed response questions were used as EQs. In addition, half of the subjects received EQs relating to the second half of the paragraph. A criterion test of 20 relevant and 20 incidental multiple-choice questions was taken by each subject immediately following completion of the reading material. This was the same test as used in the previous two studies. Frase found a main effect for question location which showed that post-questions were more facilitative than pre-questions. He also found retention of relevant information to be significantly higher than retention of incidental information. A significant interaction between question pacing and question location indicated that the more frequent the questions, the more advantage for post-questions and the more disadvantage for pre-questions. A significant interaction between question pacing and retention items indicated a high degree of relevant retention regardless of the frequency of questions and a depression of incidental retention due to frequent questioning. A significant interaction between content location of question relevant material and retention item also occurred. This result indicated that incidental information was better retained when it was located in the second half of the

paragraphs or, in other words, when it followed relevant information.

Question mode. --The form or construction of questions used as test-like events in the studies reviewed so far have been both multiple-choice and short-answer. It would appear that question mode is not an influential variable in the facilitation of the comprehension of written prose materials since consistent results have been found for the variables of question location and question pacing. Only one of the previously cited studies included question mode as an independent variable and systematically varied two fixed levels of this factor (Frase, 1968b). Multiple-choice and constructed response were used. Frase (1968b) found no significant differences for question mode.

In a study related to question mode, Frase (1968c) investigated the orientation effects of three different types of introductory questions. College subjects were given a general, specific, or comparative introductory question and the same written prose paragraph. This was immediately followed by a nine-item multiple-choice test concerning the material read. Frase found that the specific question group had the highest per cent correct on the test item relevant to their introductory question and the highest number of correct responses on the total test. These findings were

attributed to the fact that specific questions allow subjects to rehearse the stimulus, response, and the association of the two.

Repetition in written prose learning studies

Slamecka (1959, 1960) investigated the effects of repetition on the rote learning of prose materials via a serial anticipation procedure. His objective was to determine whether the manipulation of classic variables in the retention of unconnected discourse evidenced the same results when they were varied in a study of the rote retention of prose materials. Slamecka (1959), in one of three experiments, explored verbatim recall of prose material via the classic variable of degree of original learning. College subjects were given either 1, 3, 5, 6, 7, or 9 presentations of the original passage followed by original recall. Then three presentations of an interpolated passage and, finally, delayed recall of the original passage. Both original recall and delayed recall of the original passage were found to increase as degree of original learning increased.

Slamecka (1960) studied the phenomenon of retroactive inhibition in rote retention of connected discourse. College subjects were given four pairs of sentences with the first sentence as original learning and the second sentence as interpolated learning. Each subject was given various combinations of 2, 4, or 8 original learning

trials followed by 0, 4, or 8 interpolated learning trials. In addition, four relearning trials of the original learning task and three relearning trials of the interpolated learning task were also administered. The acquisition of the original learning task was found to significantly increase with increasing original learning trials at every level of interpolated learning.

A related study by Rothkopf (1968) measured the textual constraint of written prose passages. College and/or high school subjects were given one of two passages for 0, 1, 2, or 4 times. Ten minutes after reading the assigned passage, subjects were given a completion test which omitted nonfunction words. The correct number of deleted words increased with exposures for both passages in a negative accelerating fashion. Asymptote occurred at two exposures.

Rothkopf and Coke (1963, 1966) performed two studies with adult females which investigated the effect of immediate and delayed repetition of sentences during acquisition on subsequent recall of those sentences. The dependent variable was the number of correct deleted terms in the previously presented sentences. Rothkopf and Coke (1963) gave eight pairs of sentences to all subjects under various rehearsal methods for the second sentence of each pair. Subjects rehearsed the second sentence of each pair when it was

presented for the second time. In addition, the rehearsal of the second sentence of each pair was either immediately after its initial presentation or following interpolated sentences. Rothkopf and Coke (1966) presented a prose passage to all subjects in which particular sentences were or were not rephrased when repeated later in the passage. In addition, repetition of the test sentence was either immediate or followed interpolated sentences. In both studies, delayed repetition of the material to be learned produced better recall than immediate repetition.

Ausubel and Youssef (1965) investigated spaced repetition of a written prose passage. An experimental group of college subjects was administered the learning passage on the first and third days of the experiment. A control group of college subjects received another passage on the first day and the learning passage on the third day. Both groups were given a multiple-choice retention test on the fifth day. Retention scores were significantly higher for the experimental group than for the control group.

Repetition as a factor in retardate learning

For years it has been assumed that retardates benefit from repetition of the material to be learned. Therefore, repetition of the material to be learned is often times included as a methodological

procedure regardless of the learning material or major intent of the study.

Two recent reviews of basic research with suggested applications for the classroom situation (Vergason, 1968; McCarthy & Scheerenberger, 1966) suggest the use of repetition in learning tasks administered to mental retardates in order to overcome their short-term memory deficit. However, a recent study found repetition to be of little benefit to trainable mental retardates in a short-term recall task. Baumeister, Hawkins and Holland (1967) conducted a study of retroactive inhibition in short-term recall of a digit sequence by normals and trainable mental retardates of the same chronological age. A five place digit span was used for the trainables and a nine place digit span was used for normal subjects. Levels of interpolated tasks were 0, 1, 2, or 3. They found that trainable mental retardates were below chance for levels 1, 2, and 3 of the interpolated tasks. Furthermore, trainables were just above chance after 25 repetitions of the same digit sequence with no interpolated task.

Two studies differing in major intent have used repetition with educable mentally retarded subjects in learning tasks involving prose passages. Brown and Sellin (1967) investigated whole versus part presentation methods and meaningful activities versus non-meaningful activities in learning poetry. Meaningful activities were

defined as use of colorful pictures, recordings, discussion, slides, and drawings after oral presentation of the poem. Nonmeaningful activities were defined as a limited discussion after oral presentation of the poem. All four possible treatment groups were given 10 minutes of practice per day over a three-week period. The dependent variable was individual pupil errors during recitation one week after treatment. Whole presentation was found to be better than part presentation and whole-meaningful was the best combination.

Neisworth, Smith and Deno (1968) investigated the use of advanced organizers in facilitating the learning and retention of written prose materials by educable mental retardates and normals of comparable reading achievement. The learning passage was a 1200-word passage on sound. The advanced organizer was a 200-word conceptual passage which was pertinent to the learning passage. As such, it was an overview of sound and did not contain any information found in the learning passage. A 200-word control introductory passage was also used which contained examples of sound. Both subject populations contained experimental and control groups. All subjects received the advanced organizer or the control introductory passage for four days. The learning passage was also administered to all subjects on the third and fourth days. On the fourth day, a

30-item criterion test was given to all subjects following their appropriate introductory passage and the learning passage. The same test was administered to all subjects on the eighteenth day. There were no significant main effects due to subject status, treatment or retention time. However, a significant interaction between treatment and retention time occurred. This result indicated that organizer groups had higher initial retention scores than delayed retention scores. Whereas, the control groups performed better on the delayed retention test than on the initial one. A second-order interaction between treatment, subject status and retention was also significant. This result indicated that normal organizer and control groups had lower delayed retention scores than initial retention scores. However, the educable mentally retarded control group had higher delayed retention scores than initial retention scores. The normal organizer groups performed significantly better than the normal control groups on both retention measures. There were no significant differences between the educable mentally retarded organizer and control groups on either retention test.

It may be that repetition in short recall tasks and prose tasks does not facilitate the learning of such tasks by mentally retarded subjects.

Definition of terms

The studies of Frase and Rothkopf have used the term "retention" to refer to the immediate assessment of the recall of factual information from written prose materials. In addition, none of the studies investigating influential variables in learning from written prose materials have included a recall measure of relevant information following a specified length of time after the first retention test. The author prefers the terms "initial retention" and "delayed retention" in order to distinguish between these two retention measures in the present study. They are defined as follows: "initial retention" refers to the assessment of the recall of factual information immediately after presentation of the prose materials, and "delayed retention" refers to the assessment of the recall of factual information one week after presentation of the prose materials.

Delayed retention as well as initial retention of factual information from prose materials would seem to be of importance in the learning process. It may be that the same variables which influence the initial retention of factual information from prose materials also have an effect upon the delayed retention of that information. To be more precise, the use of questions after each paragraph and/or a procedure designed to gain attention may

facilitate the delayed retention of relevant factual information. For these reasons, a delayed retention measure will be included in the present study in order to assess the effects of question location and a signal designed to gain attention on delayed retention as well as initial retention of factual information from aurally presented prose materials.

Hypotheses

Based upon the importance of attention in retardate learning and previous research which has investigated the effect of question location and question pacing on the facilitation of the retention of written prose materials, it is hypothesized that:

Hypothesis 1: Questions after each paragraph will facilitate initial retention of relevant factual information in a prose passage presented aurally to trainable mentally retarded subjects when compared to a condition where questions precede each paragraph or no questions accompany each paragraph.

Hypothesis 2: Questions after each paragraph will facilitate initial retention of incidental factual information in an aurally presented prose passage when compared to

a condition where questions precede each paragraph or no questions accompany each paragraph.

Hypothesis 3: Questions after each paragraph will facilitate delayed retention of relevant factual information in an aurally presented prose passage when compared to a condition where questions precede each paragraph or no questions accompany each paragraph.

Hypothesis 4: A procedure designed to gain attention will facilitate initial retention of relevant factual information when compared to conditions where the procedure is not present.

Hypothesis 5: Questions before each paragraph will facilitate initial retention of relevant factual information when compared to a condition where no questions accompany each paragraph.

Hypothesis 6: The most facilitative condition for initial retention of relevant factual information will be combined treatment of questions after each paragraph and a procedure designed to gain attention.

Hypothesis 7: A combined treatment of questions after each paragraph and a procedure designed to gain attention will facilitate the initial retention of incidental factual information when compared to a condition where no questions accompany each paragraph, with or without a procedure designed to gain attention, or a condition where questions precede each paragraph, with or without a procedure designed to gain attention.

Hypothesis 8: The most facilitative condition for delayed retention of relevant factual information will be a combined treatment of questions after each paragraph and a procedure designed to gain attention.

Hypothesis 9: A combined treatment of questions before each paragraph and a procedure designed to gain attention will facilitate initial retention of relevant factual information when compared to a condition where no questions accompany each paragraph, with or without a procedure designed to gain attention, or a condition where questions precede each paragraph.

Hypothesis 10: Retention of relevant factual information will be better than retention of incidental factual information.

CHAPTER III

DESIGN OF THE STUDY

Sample

The sample consisted of 72 male and female trainable mentally retarded students enrolled in the secondary program of a midwestern training center for trainable mental retardates. The training center was a nonresidential school in session the five days of the normal school week. The secondary program of the center provided classes in art, music, physical education, homemaking, vocational skills, and learning skills for the trainable mentally retarded student.

Chronological ages of the students in this sample ranged from 11-8 years to 21-6 years. Intelligence quotients of these Ss ranged from 30 to 63 on the Stanford-Binet Intelligence Scale, Form L-M, 45 to 56 on the Wechsler Intelligence Scale for Children, and 43 to 61 on the Wechsler Adult Intelligence Scale. Individual chronological ages and intelligence quotients for each treatment group are presented in Appendix A. Table 1 presents the means and

standard deviations of the chronological ages and intelligence quotients for each treatment group.

Table 1

Means and Standard Deviations of the Chronological Ages and Intelligence Quotients of the Six Treatment Groups

Treatment Group	CA		IQ	
	Mean	SD	Mean	SD
I (P)	17.47	3.05	42.50	5.85
II (P*)	17.06	2.45	43.42	9.48
III (PQ)	15.07	1.76	46.17	8.73
IV (PQ*)	16.29	2.20	47.33	6.62
V (QP)	15.65	1.99	45.67	5.41
VI (QP*)	15.44	2.55	48.00	6.40

No S with an uncorrected hearing defect was included in the sample.

Design and experimental treatments

A 2 × 3 × 5 × 2 factorial design with repeated measures on the last two factors was used. The first factor, cueing, consisted of two levels--no cueing and cueing. The second factor was question

location and consisted of three levels--no questions, questions after, and questions before. The third factor represented five administrations of the same criterion test. The levels of the last factor were relevant and incidental information. Figure 1 presents a schemata of the data matrix showing the four independent variables.

Six presentation methods resulted from combinations of the levels of the first two factors. The six presentation methods included one control condition and five experimental treatment conditions. The five experimental treatment conditions involved the manipulation of relevant questions and/or a procedure designed to gain the attention of the S. This procedure consisted of the E grasping the S's shoulder and saying, "Now listen." A previous pilot study had used taped stories for presentation and had used an inserted voice on the tape which said, "Now listen" in the appropriate places. The pilot study had indicated that the simple insertions of "now listen" on the tape were not a prominent enough means of gaining the attention of the Ss. It was also felt that the procedure used in the pilot study was not classroom related because it did not typify teacher behavior. Therefore, the present procedure to gain the S's attention was devised. It was thought to be classroom related, allowed for eye contact with the S, and was felt to be an effective means of gaining the S's attention.

		Ss	T_1		T_2		T_3		T_4		T_5	
			R_1	I_1	R_2	I_2	R_3	I_3	R_4	I_4	R_5	I_5
NC	NQ	1 ⋮ 12										
	QA	13 ⋮ 24										
	QB	25 ⋮ 36										
C	NQ	37 ⋮ 48										
	QA	49 ⋮ 60										
	QB	61 ⋮ 72										

Figure 1

Data Matrix of the 2 × 3 × 5 × 2 Repeated Measures Design

The six presentation methods of the present study were as follows:

Treatment I: The control condition in which each of the 10 paragraphs of the test passage was presented without the use of relevant questions or a grasp of the shoulder and the words, "Now listen." (P)

Treatment II: A treatment condition in which the sentence(s) containing an answer(s) to the relevant question(s) for each paragraph was (were) preceded by a grasp of the shoulder and the words, "Now listen." (P*)

Treatment III: A treatment condition in which the relevant question(s) for each paragraph was (were) read to the Ss immediately after each paragraph. (PQ)

Treatment IV: A treatment condition in which the relevant question(s) for each paragraph was (were) read to the Ss immediately after each paragraph and a grasp of the shoulder and the words, "Now listen" preceded the sentence(s) containing an answer(s) to the relevant question(s) for each paragraph. (PQ*)

Treatment V: A treatment condition in which the relevant question(s) for each paragraph was (were) read to the Ss immediately before each paragraph. (QP)

Treatment VI: A treatment condition in which the relevant question(s) for each paragraph was (were) read to the Ss immediately before each paragraph and a grasp of the shoulder and the words, "Now listen" preceded the sentence(s) containing an answer(s) to the relevant question(s) for each paragraph. (QP*)

Materials

Three pre-passages and one test passage were used in this study. The three pre-passages were taken from Getting the Facts: Specific Skill Series, Book A by Richard A. Boning. All pre-passages were on a first grade reading level. The three pre-passages are presented in Appendix B. The test passage was constructed by the E. The test passage is presented in Appendix C.

The three pre-passages consisted of 148, 150, and 157 words, respectively. Each of the three pre-passages contained five paragraphs and information to answer five factual three-foil multiple-choice questions found in the listening skills booklet. The five questions for each pre-passage are presented in Appendix D.

The test passage consisted of 317 words. The test passage contained 10 distinct paragraphs which differed in the factual information found in each of them. The number of words per paragraph ranged from 24 to 46 words, with a mean word length of 31.7 words.

The test passage concerned a family who went on a one-day trip to the beach. In general, the test passage related the family's activities in preparation for the trip, on their way to the beach, while at the beach, and on their way home from the beach. In particular, the test passage described the activities and responsibilities of each family member during the course of the events preceding, during and following the time spent at the beach.

Thirty three-foil multiple-choice questions were constructed which pertained to the information found in the test passage. Three questions were constructed from the information found in each paragraph. Fifteen of the 30 questions were designated as relevant questions. These questions were heard during passage presentation by some of the Ss depending on the experimental treatment group to which Ss had been randomly assigned. Each paragraph contained information to answer one or two of the relevant questions. The other question or questions in each paragraph were incidental questions. The incidental questions were not heard by any S during passage presentation. Each paragraph contained information to answer one or two of the incidental questions. The 15 relevant and 15 incidental questions were used as the criterion test. The order of the relevant and incidental questions on the criterion test was sequential to the order of the information in the test passage which

answered each question. The criterion test is presented in Appendix E.

The criterion test was piloted in order to ascertain if relevant and incidental questions were of equal difficulty. Ten Ss were administered the control condition (P) and the condition proposed as the most facilitative (PQ*). A t test was performed on the reported item difficulties for the control condition (P) for the first administration of the criterion test. This analysis showed that relevant and incidental items were of equal difficulty ($t = -1.3057$, 28 df, $p > .05$). Table 2 presents the results of an item analysis on the three administrations of the criterion test for the control condition (P).

Table 2

Results of Item Analyses on the Pilot of the Criterion Test for Group I (P)

Item Statistics	Order of Administration		
	1	2	3
Mean item difficulty	.48	.48	.41
Mean item discrimination	.48	.48	.45
Mean point biserial correlation	..44	.42	.39
Kuder-Richardson #20	.83	.85	.83
Standard error of measurement	2.37	2.27	2.16

N = 10 Ss in Group I (P)

Table 3 presents the results of an item analysis on the three administrations of the criterion test for the condition proposed as the most facilitative (PQ*).

Table 3

Results of Item Analyses on the Pilot of the Criterion Test for Group IV (PQ*)

Item Statistics	Order of Administration		
	1	2	3
Mean item difficulty	.43	.71	.38
Mean item discrimination	.58	.05	.63
Mean point biserial correlation	.47	.32	.51
Kuder-Richardson #20	.90	.95	.93
Standard error of measurement	2.16	1.59	2.03

N = 10 Ss in Group IV (PQ*)

Procedure

Seventy-seven students enrolled in the secondary program of the training center were given the three pre-passages. Two Ss with uncorrected hearing defects were eliminated from the study. Seventy-two Ss were then randomly selected from the remaining 75 students. These 72 Ss were then randomly assigned to experimental treatment groups for administration of the test passage.

Pre-passages. --Each of the pre-passages was read to small groups of four to 10 Ss on each of three consecutive days. The E read the pre-passages. The same order of passage presentation was maintained for all groups.

One pre-passage was presented three times to each group on each of the three consecutive days. Subjects were asked the same five three-foil multiple-choice questions immediately following each presentation of the pre-passage. The E read the question and the three choices for each question. The E made certain all Ss had responded before reading the next question and its three choices.

Subjects circled their answer to each of the five questions for the pre-passage on an answer sheet which contained the three choices for each question. Subjects were closely monitored by the E, classroom teacher, and an aide to make sure the verbalized answers of the Ss coincided with their circled answers. The answer sheets were distributed immediately following each presentation of the pre-passage and collected immediately after the completion of each testing situation.

Question order was maintained for each test administration which occurred after each presentation of the pre-passage. However, the order of the three-foil answers on the answer sheet was uniformly different for all Ss for each presentation of a question.

This was done in an attempt to eliminate any response set tendency due to position cues. The different orders of the three-foil answers to the five questions for the first, second, and third pre-passage are presented in Appendix F, G, and H, respectively.

The following instructions were read to the Ss by the E immediately before the first presentation of a pre-passage on any particular day:

> Today I am going to read you a story. I will read the story three times. After I read the story each time, I am going to ask you some questions about the story. Listen carefully to the story so you can answer the questions. Now, I will read the story for the first time.

The E said, "Now, I'll read the story again" immediately before the second and third presentations of the pre-passage. No knowledge of results was given.

Vocabulary checklist. --During the two weeks required for presentation of the three pre-passages, the 77 students enrolled in the secondary program of the training center were individually administered a vocabulary checklist. This was done in order to identify any students who were not familiar with the vocabulary content of the test passage. The E asked each student a series of questions which dealt with the conceptual meaning of the vocabulary content of the test passage. The E subjectively ascertained from the verbal reports of the students whether they did nor did not understand

the meaning of particular words within the test passage. If the S could give a definitive explanation and/or exemplars of the vocabulary concepts of interest, the E concluded that the S knew the conceptual meaning of the vocabulary content of the test passage. No student was eliminated from the study on the basis of his or her verbal report to the vocabulary checklist. The vocabulary checklist is presented in Appendix I.

Test passage. --Two days after all Ss had been given the three pre-passages, the administration of the test passage began. The test passage was individually administered to all Ss in one of two small rooms which permitted the elimination of extraneous noise and/or interruptions.

Each S was brought into the testing room by the E and read the appropriate instructions for the particular treatment condition to which he or she had been randomly assigned. The six sets of instructions are presented in Appendix J.

The test passage was read three times to each S. After each presentation of the test passage the same criterion test was administered to all Ss. The E read each question, read the three answers for each question while pointing to them, and circled the reply of the S. Question order after each test passage presentation

was the same for all Ss. However, the order of the three-foil answers on the answer sheet was uniformly different for all Ss for each question presentation. This was done in an attempt to eliminate any response set tendency due to position cues. The orders of the answers for the three initial administrations of the criterion test questions are presented in Appendix K.

The following instructions were read to each S immediately after the first reading of the test passage:

> O.K. (child's name), now I'm going to read you the questions. (Child's name), each time you get a right answer I'm going to give you a piece of candy. We'll see how many pieces of candy you can get.

The criterion test was then administered for the first time. Immediately following the first administration of the criterion test the E said, "Now (child's name), I'm going to read the story again. Are you ready?" The test passage was then read for the second time. After the second reading of the test passage the E said, "O.K. (child's name), now I'm going to ask you the questions again" and administered the criterion test for the second time. Following this, the E said, "O.K. (child's name), now we're going to listen to the story one more time. Ready?" The test passage was then read by the E for the third and final time. After the third presentation of the test passage the E said, "O.K. (child's name), now I'm going

to ask you the questions one more time" and administered the criterion test for the third and final time.

Knowledge of results was given during the three initial administrations of the criterion test. Each time a S correctly answered a question, the E gave him an M & M and said, "That's right."

Two delayed retention tests were individually administered to each S one week following the three initial presentations of the test passage and criterion tests. Each S was brought by the E into one of two small testing rooms and read the following instructions:

> (Child's name), remember the story I read to you last week? It was about a family who went to the beach. They did many things while they were at the beach. The family stayed at the beach all day and got home when it was dark. Today I am going to ask you the same questions about the story that I asked you last week. Are you ready? O.K., here we go.

Immediately following the instructions the first delayed retention test was administered. The original criterion test was used. The E read each question, read the three answers for each question while pointing to them, and circled the reply of the S. Question order was the same as that used in the original criterion test. However, the three-foil answers for each question were in a different order than any used during the initial presentations of the criterion test. This order was uniform for all Ss and was done in an attempt to eliminate any response set tendency due to position cues.

The E then said:

> Now (child's name), I am going to read the story to you again. After I read the story, I am going to ask you to answer the questions one more time. Listen carefully to the story so you can answer the questions.

The E read the test passage one time via the standard presentation condition (P).

The second delayed retention test was administered immediately after this single delayed presentation of the test passage. The original criterion test was used under the same procedure as in the administration of the first delayed retention test. Question order remained the same as in the original criterion test. The three-foil answers for each question were in a different order than any used during the initial presentations or the first delayed presentation of the criterion test. This order was uniform for all Ss and attempted to eliminate any response set tendency due to position cues. The orders of the answers for the two delayed administrations of the criterion test questions are presented in Appendix L.

No knowledge of results was given on the first or second delayed retention test.

CHAPTER IV

RESULTS OF THE ANALYSES

Main Analysis

The main analysis was an analysis of covariance of the $2 \times 3 \times 5 \times 2$ design with repeated measures on the last two factors. Cueing, the first factor, consisted of cueing and no cueing. The second factor was question location and consisted of no questions, questions after, and questions before. The third factor was time and represented five administrations of the same criterion test. The levels of the fourth factor were relevant and incidental information. The decision to use analysis of covariance instead of analysis of variance was based upon (1) correlations between the covariate and dependent variables and (2) the result of a test of the assumption of homogeneity of within-group regression coefficients.

Table 4 presents the correlations between the covariate and each of the 10 dependent variables for each of the six treatment groups. The covariate was the total number of correct answers on the three pre-passages. The 10 dependent variables were the

number of correct answers to relevant and incidental questions on each administration of the criterion test. The covariate and 10 dependent variables for each S in each of the six treatment groups are presented in Appendix M.

Table 4

Correlations Between the Covariate and Number Correct Relevant and Incidental Questions on Each Administration of the Criterion Test for the Six Treatment Groups

Treatment Group	Time									
	T1		T2		T3		T4		T5	
	R	I	R	I	R	I	R	I	R	I
I (P)	.65	.74	.69	.79	.75	.82	.56	.78	.68	.73
II (P*)	.39	.46	.61	.55	.52	.54	.53	.62	.59	.63
III (PQ)	.56	.69	.44	.67	.47	.49	.53	.54	.51	.54
IV (PQ*)	.41	.37	.47	.50	.41	.57	.57	.54	.48	.49
V (QP)	.63	.75	.55	.73	.60	.74	.69	.74	.58	.80
VI (QP*)	.60	.65	.61	.68	.50	.71	.65	.66	.49	.70

R = Relevant questions

I = Irrelevant questions

As can be seen from the data in Table 4, the correlations between the covariate and each of the 10 dependent variables tend to

be high. The correlations of .50 or above are significantly greater than zero. However, none of the 60 correlations are < .30: the recommended absolute value of the correlation coefficient in order to increase precision by means of analysis of covariance (Elashoff, 1969, p. 386). The mean correlations for treatment groups I, II, III, IV, V, and VI are .72, .54, .48, .68, and .62, respectively.

In order to test the assumption of homogeneity of within-group regression coefficients, the procedure discussed by Kirk (1968, pp. 469-470) was used. The F test was not significant (F = .0146, 5/60, $p > .25$). This result indicated that the within-group regression coefficients for the six treatment groups were homogeneous.

The means and standard deviations of the number of correct answers to relevant and incidental questions for each treatment group at each administration of the criterion test are presented in Table 5. Figure 2 shows the mean number of correct answers to relevant questions for each treatment group at each administration of the criterion test. Figure 3 shows the mean number of correct answers to incidental questions for each treatment group at each administration of the criterion test.

Table 5

Mean Number of Correct Answers for Relevant and Incidental Questions at Each Administration of the Criterion Test for Each of the Six Treatment Groups

Order of Administration	Type of Information		Treatment Group					
			P	P*	PQ	PQ*	QP	QP*
T1	R	Mean	10.00	8.92	10.75	10.00	11.00	10.08
		SD	3.34	2.29	2.83	2.74	2.74	3.12
T1	I	Mean	9.08	7.75	9.00	8.50	8.75	7.58
		SD	4.09	2.68	3.56	3.50	2.80	3.20
T2	R	Mean	9.92	9.42	12.08	10.33	11.83	10.42
		SD	3.17	3.40	3.25	3.30	3.44	3.04
T2	I	Mean	9.58	8.75	10.50	8.75	10.25	8.83
		SD	3.95	2.05	3.62	2.98	3.32	3.48
T3	R	Mean	10.58	8.17	12.08	10.75	12.00	10.83
		SD	3.75	3.53	2.90	3.22	3.14	2.91
T3	I	Mean	10.42	8.08	10.92	10.00	11.17	10.08
		SD	3.38	3.86	3.10	2.58	3.80	2.66
T4	R	Mean	10.50	8.92	11.33	9.83	11.83	9.92
		SD	3.48	3.82	3.68	3.18	2.67	3.33
T4	I	Mean	10.42	8.58	9.83	8.50	10.67	8.67
		SD	3.57	3.52	3.67	2.78	3.52	3.35
T5	R	Mean	11.17	8.83	11.83	11.08	12.08	10.42
		SD	3.69	4.24	3.31	2.87	3.30	3.28
T5	I	Mean	10.83	8.00	10.33	9.58	10.58	9.58
		SD	3.51	3.70	3.97	3.15	4.13	3.01

N = 12 in each treatment group

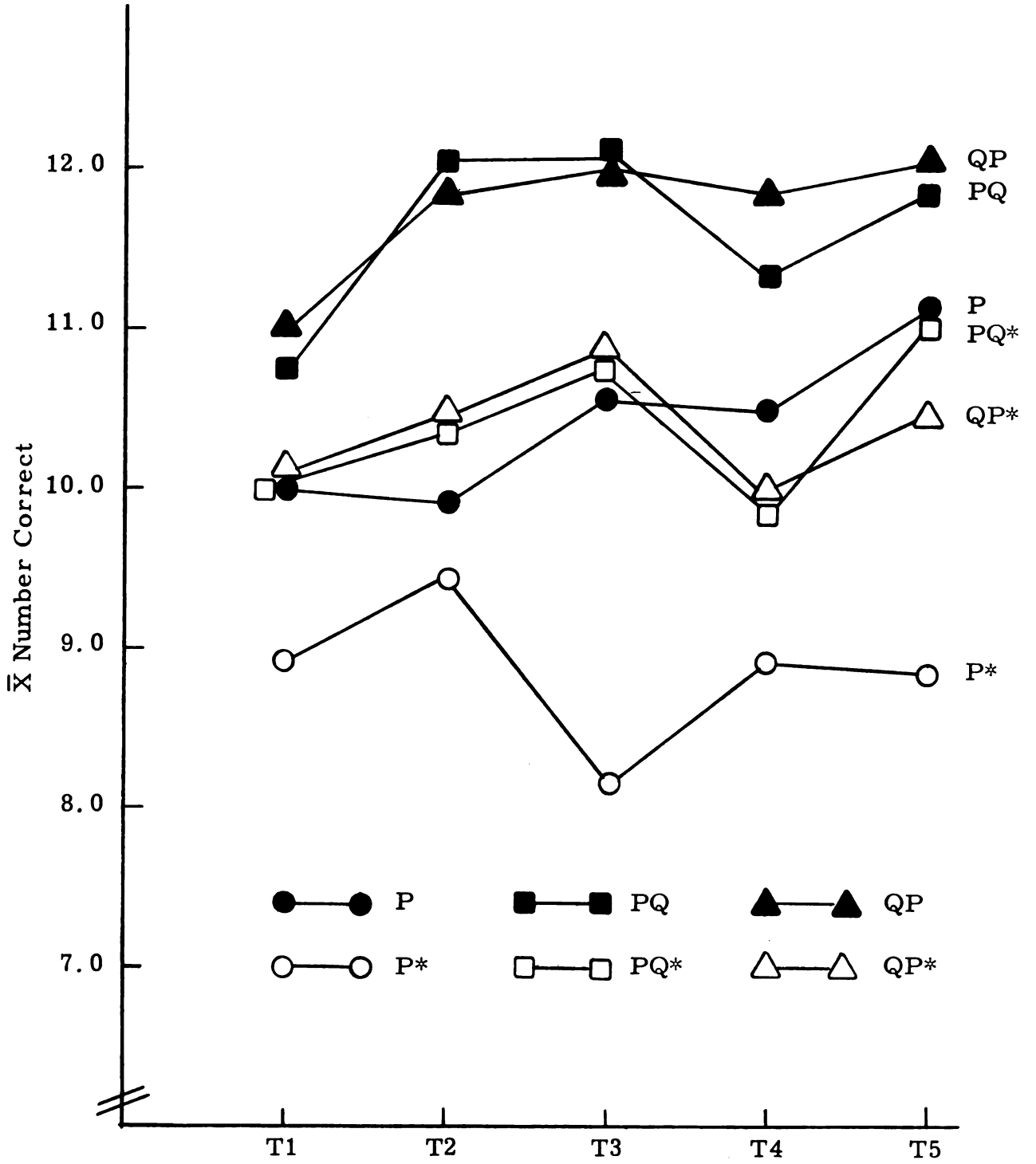

Figure 2

Mean Number Correct Relevant Questions for Each Treatment Group at Each Administration of the Criterion Test

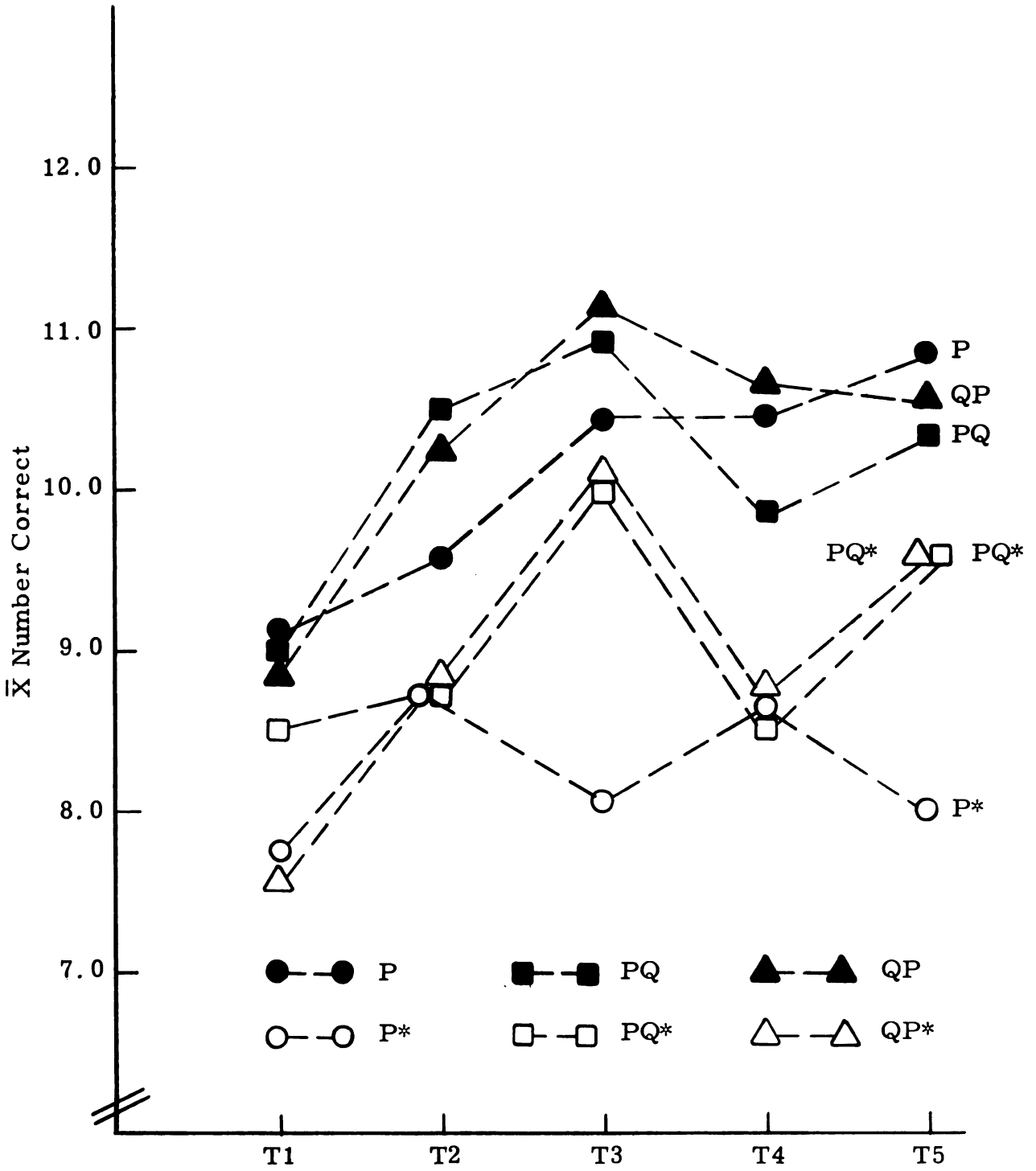

Figure 3

Mean Number Correct Incidental Questions for Each Treatment Group at Each Administration of the Criterion Test

A 2 × 3 × 5 × 2 analysis of covariance with repeated measures on the last two factors was performed on the data summarized in Table 5. The four independent variables and the levels of each were cueing (no cueing and cueing); question location (no questions, questions after and questions before); time (five administrations of the same criterion test) and information (relevant and incidental). Only one covariable was used and, therefore, only between Ss sources of variation were adjusted for the covariable (See Kirk, 1968, pp. 482-485 and Winer, 1962, p. 607). The results of this analysis of covariance are presented in Table 6.

The results of the 2 × 3 × 5 × 2 analysis of covariance with repeated measures on the last two factors indicated that the main effect of Time, the main effect of Information, and T × I were significant sources of variation when the Geisser-Greenhouse conservative F test (See Kirk, 1968, pp. 262-263) was applied to the data presented in Table 6. The four independent variables were cueing (no cueing and cueing); question location (no questions, questions after and questions before); time (five administrations of the same criterion test) and information (relevant and incidental). Therefore, only these three sources of variation were considered for post hoc investigations following the over-all main analysis.

Table 6

Summary Table for 2 × 3 × 5 × 2 Analysis of Covariance with Repeated Measures on the Last Two Factors

Source	SS	df	MS	F
Between Subjects				
C (adj.)	339.172	1	339.172	3.48
Q (adj.)	129.467	2	64.734	.66
CQ (adj.)	10.223	2	5.112	.05
S:CQ (adj.)	6342.217	65	97.573	
Within Subjects				
T	119.690	4	29.920	13.42*
CT	12.270	4	3.070	1.38
QT	34.690	8	4.340	1.95*
CQT	34.870	8	4.360	1.96*
S:TCQ	588.280	264	2.230	
I	222.220	1	222.220	36.79*
CI	0.000	1	0.000	0.00
QI	34.540	2	17.270	2.86
CQI	1.460	2	.730	.12
S:ICQ	398.380	66	6.040	
TI	21.650	4	5.410	4.36*
CTI	.570	4	.140	.11
QTI	5.420	8	.680	.55
CQTI	1.810	8	.230	.19
S:TICQ	327.950	264	1.240	

* $p < .05$

Note: Only T, I, and T × I were significant ($p < .05$) using the Geisser-Greenhouse conservative $\underline{F}$ test. See Kirk (1968, pp. 262-263).

Hypothesis 10 stated that retention of relevant information would be better than retention of incidental information. The mean number of correct answers for relevant questions was 10.564 and the mean number of correct answers for incidental questions was 9.453. Therefore, hypothesis 10 was supported. The retention of relevant information was better than the retention of incidental information.

The significant main effect of Time was investigated by means of pairwise and complex Scheffé contrasts of the number of correct questions at each administration of the criterion test. The degrees of freedom for the Geisser-Greenhouse conservative F test were used for all Scheffé contrasts involving the main effect of Time. The pairwise Scheffé contrasts revealed two significant results. More questions were answered correctly on both the third administration and the fifth administration of the criterion test than on the first administration. There were no other significant pairwise differences. Table 7 presents these results.

A complex Scheffé contrast of initial (T1 + T2 + T3) versus delayed (T4 + T5) retention was performed. The mean total number correct for each administration of the criterion test are presented in Table 7. The average of the mean total number correct for initial retention was 9.92 and 10.14 for delayed retention. The average mean difference between initial and delayed retention (-.2167) was

not significant (critical value = .6406, 1/66 df, $p > .05$). This result indicated that there was no difference between initial and delayed retention.

Table 7

Matrix of Differences in Mean Total Number Correct Questions Between Administrations of the Criterion Test

	T1	T4	T2	T5	T3
T1 = 9.29	----	.63	.77	1.07*	1.13*
T4 = 9.92		----	.14	.44	.50
T2 = 19.06			----	.30	.36
T5 = 10.36				----	.06
T3 = 10.42					----

Critical value at .05 level (1, 66) = .99

Figure 4 shows the interaction between Time and Information. The means and standard deviations of the number of correct answers for relevant and incidental questions for each administration of the criterion test are presented in Table 8.

Scheffé contrasts were used in order to investigate pairwise differences in relevant information between each administration of the criterion test. The MS error term for these contrasts (S:TCQ)

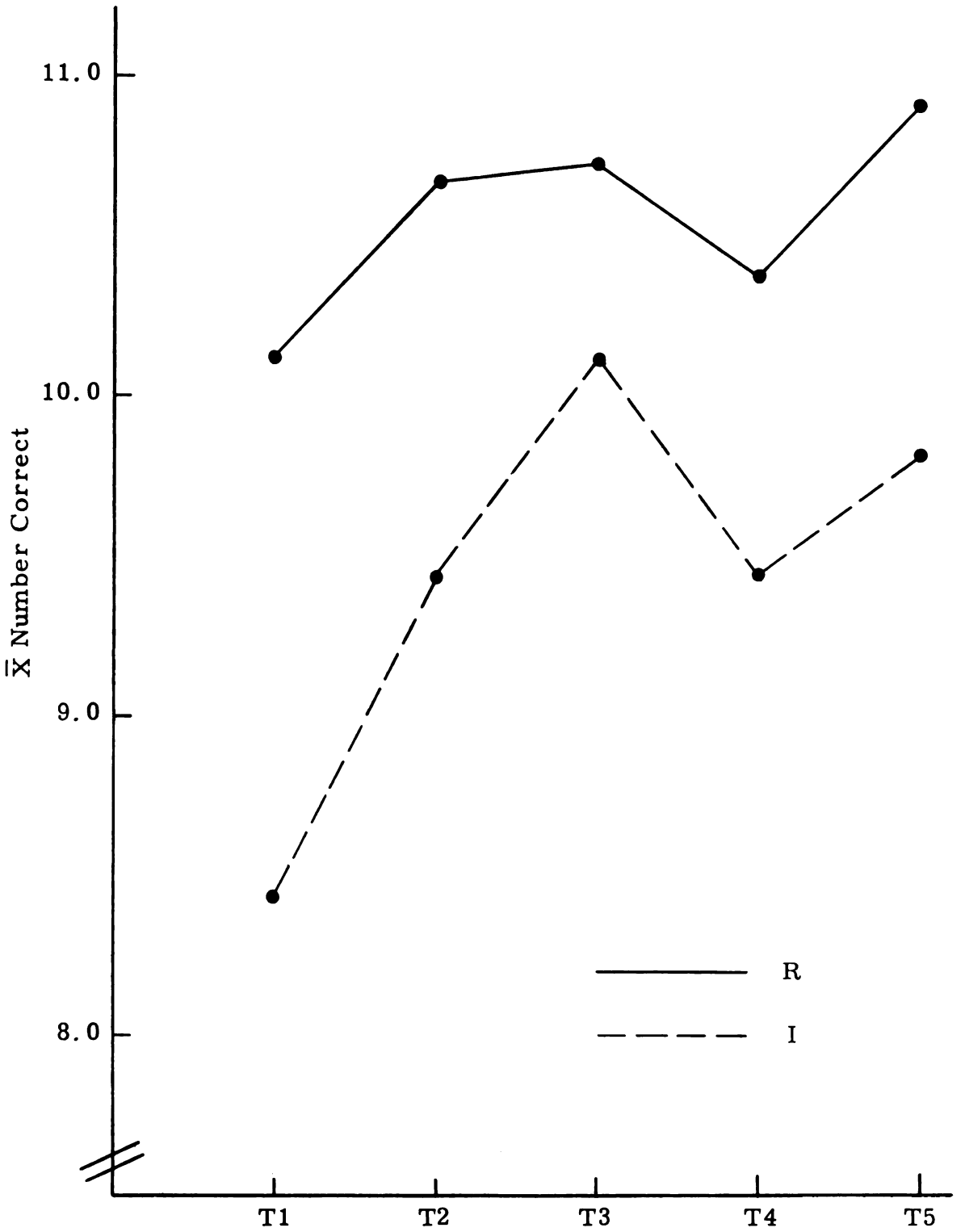

Figure 4

Means for Relevant and Incidental Information
Across All Treatment Groups
T × I

Table 8

Mean Number of Correct Answers for Relevant and Incidental Questions for Each Administration of the Criterion Test

Order of Administration		Type of Information	
		Relevant	Incidental
T1	Mean	10.13	8.44
	SD	2.92	3.40
T2	Mean	10.67	9.44
	SD	3.40	3.38
T3	Mean	10.74	10.11
	SD	3.49	3.42
T4	Mean	10.39	9.44
	SD	3.52	3.54
T5	Mean	10.90	9.82
	SD	5.26	3.71

N = 72 at each level of Time

was obtained from a 2 × 3 × 5 analysis of variance of the number of correct answers to relevant questions at each administration of the criterion test. The appropriate degrees of freedom were those for the Geisser-Greenhouse conservative F test. No significant pairwise differences were found in relevant information between each administration of the criterion test. Table 9 presents these results.

Table 9

Matrix of Differences in Mean Number Correct Relevant Questions Between Administrations of the Criterion Test

	T1R	T4R	T2R	T3R	T5R
T1R = 10.13	---	.26	.54	.61	.77
T4R = 10.39		---	.28	.35	.51
T2R = 10.67			---	.07	.23
T3R = 10.74				---	.16
T5R = 10.90					---

Critical value at .05 level (1, 66) = .86

A 2 × 3 × 5 analysis of variance of the number of correct answers to incidental questions at each administration of the criterion test was also performed. The appropriate MS error term from this 2 × 3 × 5 analysis of variance (S:TCQ) was used for Scheffé contrasts of pairwise differences in incidental information between each administration of the criterion test. The degrees of freedom were those from the Geisser-Greenhouse conservative $\underline{F}$ test. The Scheffé contrasts of differences in the retention of incidental information between administrations of the criterion test revealed four significant results. More incidental questions were answered correctly at each of the second, third, fourth, and fifth administrations

of the criterion test than on the first administration. These results are presented in Table 10.

Table 10

Matrix of Differences in Mean Number Correct Incidental Questions Between Administrations of the Criterion Test

	T1I	T2I	T4I	T5I	T3I
T1I = 8.44	----	1.00*	1.00*	1.38*	1.67*
T2I = 9.44		----	0.00	.38	.67
T4I = 9.44			----	.38	.67
T5I = 9.82				----	.29
T3I = 10.11					----

Critical value at .05 level (1, 66) = .89

Differences between relevant and incidental information at each administration of the criterion test were investigated by means of a 2 × 3 × 10 analysis of variance and subsequent Scheffé contrasts of pairwise differences. The appropriate MS error (S:TCQ) from the 2 × 3 × 10 analysis of variance of correct answers to relevant and incidental questions at each administration of the criterion test was used for the Scheffé contrasts. The degrees of freedom were those for the Geisser-Greenhouse conservative $\underline{F}$ test. The Scheffé

contrasts indicated that significantly more relevant than incidental questions were answered correctly on the first administration of the criterion test. There were no significant differences between the number of correct relevant and incidental questions at any other administration of the criterion test. Table 11 presents these results.

Exact Hypotheses

Hypotheses one through nine stated expected differences between treatment groups in terms of the retention of initial-relevant, delayed-relevant, and initial-incidental information. However, the complex Scheffé contrast of initial versus delayed retention indicated that the difference between initial and delayed retention was not significant. Therefore, those hypotheses which proposed differences between the same treatment groups, but in terms of initial-relevant retention for one hypothesis and delayed-relevant retention for the other hypothesis, were now considered as one hypothesis. Hypothesis one (initial-relevant retention) and hypothesis three (delayed-relevant retention) stated that treatment groups receiving questions after each paragraph would retain more than treatment groups receiving questions before each paragraph or treatment groups receiving no questions. Hypothesis six (initial-relevant retention) and hypothesis

Table 11

Matrix of Differences Between Mean Number Correct
Relevant and Incidental Questions
at Each Administration of the Criterion Test

	T1I	T2I	T4I	T5I	T3I	T1R	T4R	T2R	T3R	T5R
T1I = 8.44	----	1.00	1.00	1.38	1.67*	1.69*	1.95*	2.23*	2.30*	2.46*
T2I = 9.44		----	0.00	.38	.67	.69	.95	1.23	1.30	1.46
T4I = 9.44			----	.38	.67	.69	.95	1.23	1.30	1.46
T5I = 9.82				----	.29	.31	.57	.85	.92	1.08
T3I = 10.11					----	.02	.28	.56	.63	.79
T1R = 10.13						----	.26	.54	.61	.77
T4R = 10.39							----	.28	.35	.51
T2R = 10.67								----	.07	.23
T3R = 10.74									----	.16
T5R = 10.90										----

Critical value at .05 level (1, 66) = 1.48

eight (delayed-relevant retention) stated that the most facilitative condition would be treatment group IV (PQ*). Hypotheses one and three were then considered as one hypothesis (1&3) and hypotheses six and eight were then considered as one hypothesis (6&8). Table 12 presents a summarized restatement of hypotheses one through nine in terms of retention of relevant and incidental information.

Table 12

Summarized Restatement of Hypotheses One Through Nine

Type of Information	
Relevant	Incidental
$H_{1\&3}$: $PQ + PQ^* > QP + QP^* + P + P^*$	H_2: $PQ + PQ^* > QP + QP^* + P + P^*$
H_4 : $P^* + PQ^* + QP^* > PQ + P + QP$	H_7: $PQ^* > P + P^* + QP + QP^*$
H_5 : $QP + QP^* > P + P^*$	
$H_{6\&8}$: $PQ^* > P + P^* + PQ + QP + QP^*$	
H_9 : $QP^* > P + P^* + QP$	

In order to investigate the restated hypotheses in Table 12, the original 10 dependent variables were collapsed to form two new dependent variables. The two new dependent variables were the total number correct relevant questions and the total number correct

incidental questions. The means and standard deviations for the total number correct relevant and incidental questions for each treatment group are presented in Table 13.

Table 13

Mean Total Number Correct Relevant and Incidental Questions for Each Treatment Group

Treatment Group	Relevant		Incidental	
	Mean	SD	Mean	SD
I (P)	52.17	16.64	50.33	17.86
II (P*)	44.25	16.43	41.17	14.53
III (PQ)	58.08	15.40	50.58	17.26
IV (PQ*)	52.00	14.21	45.33	13.83
V (QP)	58.75	14.29	51.42	16.85
VI (QP*)	51.67	14.68	44.75	14.77

Hypotheses one and three, four, five, six and eight, and nine were investigated by means of a 1×6 analysis of covariance of the total number correct relevant questions for each treatment group and subsequent complex Scheffé contrasts. The results of the 1×6 analysis of covariance for relevant information are presented in Table 14.

Table 14

1 × 6 Analysis of Covariance Summary Table for Total Number Correct Relevant Questions for Each Treatment Group

Source	SS	df	MS	F
Between groups, adj.	1080.20	5	216.04	1.26
Within groups, adj.	11133.20	65	171.28	
Total, adj.	2213.40	70		

$F_{.05;\ 5,65} = 2.36$

These results indicated that there were no between-group differences in the total number of correct relevant questions.

Nevertheless, complex Scheffé contrasts were used to investigate the specific information contained in the exact hypotheses. The weighted Scheffé contrasts for hypotheses one and three, four, five, six and eight, and nine are presented in Table 15. These weights were assigned so that the sum of the weights would equal zero for each of the hypotheses one and three, four, five, six and eight, and nine.

Hypotheses one and three stated that treatment groups receiving questions after each paragraph would score higher on retention of relevant questions than treatment groups receiving

questions before each paragraph or groups not receiving questions. The average adjusted mean difference of the Scheffé contrast for hypotheses one and three (3.79) was not significant (critical value = 11.24, 5/65 df, $p > .05$). This result indicated that post-questions did not facilitate the retention of relevant information when compared to pre-questions or no questions. Hypotheses one and three were not supported.

Table 15

Weighted Scheffé Contrasts for Hypotheses Concerned With Retention of Relevant Information

Hypothesis	Weighted Scheffé Contrast
1&3	$[(+\frac{1}{2})PQ+(+\frac{1}{2})PQ^*] -[(-\frac{1}{4})QP+(-\frac{1}{4})QP^*+(-\frac{1}{4})P+(-\frac{1}{4})P^*]$
4	$[(+\frac{1}{3})P^*+(+\frac{1}{3})PQ^*+(+\frac{1}{3})QP^*] -[(-\frac{1}{3})P+(-\frac{1}{3})PQ+(-\frac{1}{3})QP]$
5	$[(+\frac{1}{2})QP+(+\frac{1}{2})QP^*] -[(-\frac{1}{2})P+(-\frac{1}{2})P^*]$
6&8	$(+1)PQ^* -[(-\frac{1}{5})P+(-\frac{1}{5})P^*+(-\frac{1}{5})PQ+(-\frac{1}{5})QP+(-\frac{1}{5})QP^*]$
9	$(+1)QP^* -[(-\frac{1}{3})P+(-\frac{1}{3})P^*+(-\frac{1}{3})QP]$

Hypothesis four stated that treatment groups who were given a procedure designed to gain attention would score higher on retention of relevant questions than treatment groups who were not given a procedure designed to gain attention. The average adjusted mean

difference of the Scheffé contrast for hypothesis four (-5.36) was not significant (critical value = 10.64, 5/65 df, $p > .05$). This result indicated that the procedure designed to gain attention did not facilitate the retention of relevant information. Hypothesis four was not supported.

Hypothesis five stated that treatment groups who received questions before each paragraph would score higher on retention of relevant questions than treatment groups who did not receive questions. The average adjusted mean difference of the Scheffé contrast for hypothesis five (5.12) was not significant (critical value = 13.03, 5/65 df, $p > .05$). This result indicated that pre-questions did not facilitate the retention of relevant information when compared to no questions.

Hypotheses six and eight stated that the group who received the combined treatment of questions after each paragraph and a procedure designed to gain attention would score higher on retention of relevant questions than any other treatment group. The average adjusted mean difference of the Scheffé contrast for hypotheses six and eight (.437) was not significant (critical value = 14.24, 5/65 df, $p > .05$). This result indicated that the combination of post-questions and a procedure designed to gain attention was not the most facilitative condition for retention of relevant information. Hypotheses six and eight were not supported.

Hypothesis nine stated that the group who received the combined treatment of questions before each paragraph and a procedure designed to gain attention would score higher on retention of relevant questions than treatment groups who only received questions before each paragraph or no questions, with or without the procedure designed to gain attention. The average adjusted mean difference of the Scheffé contrast for hypothesis nine (-1.31) was not significant (critical value = 15.00, 5/65 df, $p > .05$). This result indicated that the combination of pre-questions and a procedure designed to gain attention did not facilitate the retention of relevant information when compared to pre-questions only or no questions regardless of whether the procedure involved an attempt to gain Ss attention.

Hypotheses two and seven were investigated by means of a 1×6 analysis of covariance of the total number correct incidental questions for each treatment group and subsequent complex Scheffé contrasts. Hypothesis two stated that treatment groups who received questions after each paragraph would score higher on retention of incidental questions than treatment groups who received questions before each paragraph or did not receive questions. Hypothesis seven stated that the group who received the combined treatment of questions after each paragraph and a procedure designed to gain attention would score higher on retention of incidental questions

than treatment groups who received questions before each paragraph, with or without a procedure designed to gain attention, or treatment groups who received no questions, with or without a procedure designed to gain attention. The results of the 1 × 6 analysis of covariance for incidental information is presented in Table 16.

Table 16

1 × 6 Analysis of Covariance Summary Table for Total Number Correct Incidental Questions for Each Treatment Group

Source	SS	df	MS	F
Between groups, adj.	525.55	5	105.11	.71
Within groups, adj.	9685.65	65	149.01	
Total, adj.	10211.20	70		

$F_{.05;\ 5,65} = 2.36$

These results indicated that there were no between group differences in the total number of correct incidental questions.

Nevertheless, complex Scheffé contrasts were used to investigate the specific information contained in the exact hypotheses. The weighted Scheffé contrasts for hypotheses two and seven are presented in Table 17. These weights were assigned so that the sum of the weights would equal zero for each of hypotheses two and seven.

Table 17

Weighted Scheffé Contrasts for Hypotheses Concerned with Retention of Incidental Information

Hypothesis	Weighted Scheffé Contrast
2	$[(+\frac{1}{2})PQ+(+\frac{1}{2})PQ^*] - [(-\frac{1}{4})QP+(-\frac{1}{4})QP^*+(-\frac{1}{4})P+(-\frac{1}{4})P^*]$
7	$(+1)PQ^* - [(-\frac{1}{4})P+(-\frac{1}{4})P^*+(-\frac{1}{4})QP+(-\frac{1}{4})QP^*]$

The average adjusted mean difference of the Scheffé contrast for hypothesis two (1.60) was not significant (critical value = 10.49, 5/65 df, $p > .05$). This result indicated that post-questions did not facilitate the retention of incidental information when compared to pre-questions or no questions. Hypothesis two was not supported.

The average adjusted mean difference of the Scheffé contrast for hypothesis seven (.05) was not significant (critical value = 13.55, 5/65 df, $p > .05$). This result indicated that the combination of post-questions and a procedure designed to gain attention did not facilitate the retention of incidental information when compared to pre-questions or no questions regardless of whether the procedure involved an attempt to gain Ss attention.

CHAPTER V

DISCUSSION

Introduction

The results of the present study indicated that trainable mental retardates presented with an aural prose learning task do not benefit from a procedure designed to gain attention or adjunct questions, regardless of location, within the passage. The repeated measures analysis of covariance revealed no significant differences due to the main effect of Cueing, the main effect of Question Location, or the interaction of Cueing and Question Location. However, within Ss sources of variation due to the main effect of Time, the main effect of Information, and the interaction of Time and Information were significant.

Post hoc investigations of the significant main effect of Time indicated that (1) more questions were answered correctly on both the third and fifth administration of the criterion test than on the first administration and that (2) there was no difference between initial and delayed retention. The significant main effect of

Information showed that the retention of relevant information was better than the retention of incidental information. Post hoc investigations of the significant interaction of Time and Information indicated (1) no pairwise differences in relevant information between each administration of the criterion test, (2) more incidental questions were answered correctly at each of the second, third, fourth, and fifth administrations of the criterion test than on the first administration, and (3) more relevant than incidental questions were answered correctly only on the first administration of the criterion test.

Conclusions

The major conclusions of this study were:

1. None of the six methods of aurally presenting prose materials to trainable mental retardates proved to be superior to any of the others.

2. A procedure designed to gain the attention of the trainable mental retardate in an aural prose learning task did not facilitate retention of information found in the passage.

3. Adjunct questions, regardless of location, did not facilitate the retention of relevant or incidental information found in a prose passage presented aurally to trainable mental retardates.

4. Trainable mental retardates retained relevant information better than incidental information from an aurally presented prose passage.

5. Trainable mental retardates retained as much relevant and/or incidental information from an aurally presented prose passage one week following the original presentations as they did immediately following the original presentations.

Discussion

Engineering the attention of the retardate. -- The fact that cueing was an ineffective means of facilitating the retention of relevant information in a prose passage presented aurally to trainable mentally retarded children does not support the attention theory of retardate learning (House and Zeaman, 1960; Zeaman and House, 1963). House and Zeaman (1960) and Zeaman and House (1963) hypothesized an attention deficit instead of a learning deficit on the part of the mentally retarded from their investigations of

two-choice, simultaneous, visual discrimination learning tasks. It may be that the attention theory of retardate learning is appropriate only for visual discrimination learning tasks, and the same findings are not to be found in other types of learning tasks.

Another explanation for the obtained results is the procedure designed to gain the attention of the retardate in the present study may have served as a distractor instead of an attention-getting device. The grasp of the S's shoulder and the E's words, "Now listen," may have caused a startle response instead of gaining the attention of the S. Instead of directing the S's attention to the relevant characteristics of the learning material, the E may have, unknowingly, simply succeeded in distracting the S. If so, the S's attention would have been diverted from the passage instead of being directed toward the relevant sentences within each paragraph.

There is some evidence to suggest that Ss were aware of the procedure that was used to gain attention. During the delayed retention segment of the study, when the attention-getting device was not used, several Ss said to the E, "Oh, you're not going to poke me?" or "Now listen." This would indicate that at least some Ss were aware of the procedure designed to gain attention.

In addition, the trainable mental retardate who received cueing may only have been able to attend to a limited amount of

information at one time. He may not have been able to attend to all 15 relevant sentences during the course of one reading of the test passage. Therefore, his attention may have been focused on a particular sub-set of the 15 relevant sentences during one reading of the test passage and a different sub-set of the 15 relevant sentences may have received his attention on a subsequent reading(s) of the test passage. Furthermore, the trainable mentally retarded individual may possess a limited capacity for retention of correctly recalled information. When he elicits a new correct response toward which his attention has been directed, the trainable mental retardate may incorrectly answer a question which was previously correct.

In order to investigate the above propositions and others to be discussed later, four new dependent variables were tallied and analyzed. The new dependent variables were the number of (1) relevant new correct responses, (2) relevant incorrect responses previously correct, (3) incidental new correct responses, and (4) incidental incorrect responses previously correct. Table 18 presents the variances of these four new dependent variables after the third administration of the criterion test for each of the six treatment groups.

It was hypothesized that the variability of the relevant new correct responses and relevant incorrect responses previously

Table 18

Variances of Relevant and Incidental New Correct Responses and Incorrect Responses Previously Correct After the Third Administration of the Criterion Test

Treatment Group	Relevent New Correct Response	Relevant Incorrect Response Previously Correct	Incidental New Correct Response	Incidental Incorrect Response Previously Correct
I (P)	1.29	2.25	2.46	1.69
II (P*)	1.52	2.26	2.40	2.69
III (PQ)	3.57	2.90	3.92	2.08
IV (PQ*)	4.43	2.29	3.56	2.07
V (QP)	1.92	1.46	4.75	3.25
VI (QP*)	4.06	2.83	5.54	1.57

correct would be higher for cued groups than for non-cued groups (1) if the procedure designed to gain attention had diverted attention instead of directing attention, (2) if the cued Ss changed the sub-set of questions they focused on, and (3) if cueing interacted with a limited capacity for correct responses. An F ratio of the variability for relevant new correct responses for cued versus non-cued groups was not significant ($F = 1.48$, 33/33 df, $p > .05$). An F ratio of variability for relevant incorrect responses previously correct for

cued versus non-cued groups was also not significant (F = 1.12, 33/33 df, $p > .05$). Therefore, cueing did not result in more variability than non-cueing for relevant new correct responses and relevant incorrect responses previously correct.

It seems that the only conclusion to be drawn from the thorough investigation of the data is that the present procedure designed to gain the attention of the trainable mental retardate in an aurally presented prose learning task did not facilitate the retention of the retardate. No explanation can, as yet, be offered for this result.

The inducement of mathemagenic behavior. --Questions, regardless of location, did not facilitate the retention of information in prose materials presented aurally to trainable mental retardates. This fact does not support the mathemagenic behavior theory of Rothkopf (1963) or the general findings of written prose learning studies (Rothkopf, 1966; Rothkopf and Bisbicos, 1967; Frase, 1967, 1968a, 1968b). However, these findings and the theory of mathemagenic behavior were found and developed from studies of written prose using college students as Ss. It may be that trainable mentally retarded individuals do not engage in mathemagenic behavior as a result of adjunct questions or that adjunct questions do not facilitate

the retention of information in a prose passage presented aurally to trainable mental retardates.

In the present study there is some evidence to suggest that both questions before each paragraph and questions after each paragraph diverted the S's attention rather than focusing or directing the S's attention on relevant material within the passage. The F ratios of variability indicated significantly more variability in relevant new correct responses after the third administration of the criterion test for post-question treatment groups than for no-question treatment groups ($F = 2.75$, 22/22 df, $p < .05$) and for pre-question treatment groups than for no-question treatment groups ($F = 2.13$, 22/22 df, $p < .05$). Another F ratio of variability also indicated significantly more variability in incidental new correct responses after the third administration of the criterion test for pre-question treatment groups than for no-question treatment groups ($F = 2.18$, 22/22 df, $p < .05$). There were no significant differences between pre- and post-question treatment groups in the variability of relevant or incidental new correct responses and relevant or incidental incorrect responses previously correct. Therefore, both pre- and post-questions may have served as distractors for relevant information and pre-questions may have diverted the S's attention from incidental information.

It seems that the only conclusions to be drawn from these findings is that the use of adjunct questions in prose material presented aurally to trainable mental retardates does not induce mathemagenic behaviors. In fact, pre- and post-questions may serve as distractors in the retardate's learning of the material. In a recent article, Rothkopf (1970) more clearly defines the mathemagenic effects of human activities in specified instructional situations. He specifies four categories of mathemagenic effects as (1) mathemagenic positive, (2) mathemagenic negative, (3) mathemagenic neutral, and (4) mathemagenic unknown. Mathemagenic positive effects are defined as those effects which result from activities which are "conducive to the attainment of the specified instructional objectives" (Rothkopf, 1970, p. 327). Mathemagenic negative effects result from activities which "interfere" with the attainment of specified instructional objectives. The results of the present experiment are an example of mathemagenic neutral effects.

The use of immediate, 100 per cent reinforcement may also have contributed to the results of the present study. Most of the pre-1970 studies have not included motivation and have not manipulated an incentive variable. It may be that a high level of motivation or incentive overrides or masks the effects of pre- and post-questions interspersed within a prose passage. Frase (1970)

discusses incentive or the motivational level of the learner as one of three major boundary conditions for mathemagenic behaviors. He reports a recent study (Frase, Patrick, and Schumer, 1970) in which incentive level, frequency of questions, and question location were manipulated. The findings suggest that (1) post-questions work best at a low incentive level, (2) groups receiving pre-questions are below no-question groups and post-question groups at moderate incentive levels and that (3) no differences occur between the three question groups at high levels of incentive. Perhaps the high level of incentive used in the present study was a contributing factor to the results which showed no differences between no-question, pre-question, and post-question groups.

Initial versus delayed retention. --The fact that there were no significant differences between initial and delayed retention is encouraging. In fact, there were no significant differences between the third administration of the criterion test and the fourth administration for relevant information, incidental information, and relevant and incidental information combined. It should be remembered that the fourth administration of the criterion test took place one week after the third administration and was not prompted by another reading of the passage.

These findings suggest that information which trainable mental retardates learn from a prose passage presented aurally several times is retained after a relatively long period.

The finding of no difference in initial and delayed retention under the conditions of the present study are similar to those general findings of reminiscence in pursuit-motor learning tasks. The similarity suggests that trainable mental retardates who receive massed, reinforced practice on an aural prose learning task remain at the same level of retention performance after a one week delay. This would indicate that once the trainable mental retardate learns information from repeated aural prose material he retains that information over a relatively long period of time.

Implications for Future Research

The fact that cueing and adjunct questions were ineffective in facilitating the retention of information from prose materials presented aurally to trainable mentally retarded individuals suggests several investigations which should be conducted. Hopefully, these investigations would clarify the present findings and the attention theory of retardate learning. These investigations might also extend the mathemagenic behavior theory in aural presentations of prose material.

The exact methodology and materials used in the present study should be used in two separate studies. One of these would have normal first grade children as Ss and the other would have educable mental retardates as Ss. These two studies would, hopefully, indicate whether the present findings were due to the methodology presently employed or the intellectual level of the Ss.

An aural prose learning study should also be conducted using college students as Ss. The methodology of this study would be identical to the present one with two exceptions. The procedure designed to gain attention would not be included and the material would be presented to the Ss only one time during the original presentation. This situation, plus the use of a delayed retention measure, would extend our knowledge concerning mathemagenic behavior. It would allow us to see if influential variables operate in the same manner in aural prose material as they do in written prose material. The use of a delayed retention measure would permit one to investigate the effects of mathemagenic behavior on longer retention intervals.

Current theorizing with respect to retardate learning of an aural prose task is limited. The present study does indicate that repetition of the materials to be learned is beneficial and that repeated, aural, prose materials are retained by the retardate over

a relatively long period of time. However, specific methodologies cannot be suggested from the results of this study.

A few words of caution are herein directed toward those who would engage in future research endeavors concerned with the aural prose learning of mentally retarded individuals. Specific methodologies and the manipulations of specific independent variables found to facilitate prose learning of college sophomores should be viewed with caution when one attempts to adopt these in retardate learning of an aural prose task. In fact, generalizations from specific methodologies and the manipulations of independent variables in written prose learning tasks with college sophomores may not be able to be made in aural prose learning tasks with college students as Ss. With this in mind, only future research efforts will allow us to more clearly delineate the retardate's learning of aural prose material.

CHAPTER VI

SUMMARY

This study was conducted in order to investigate the facilitation of immediate and delayed recall of factual information from prose materials presented aurally to trainable mental retardates. Trainable mentally retarded individuals receive most of their verbal information by auditory means due to the inability to read. Therefore, an investigation of methods designed to facilitate the retention of prose materials presented aurally to trainable mental retardates could contribute useful information for the instruction of these children. It was also felt that this kind of investigation could lend itself to an existing theory concerning the learning processes of trainable mentally retarded children. And furthermore, it was thought that such studies would disclose some of the variables which influence the recall of factual information in aurally presented prose materials.

Presentation methods were devised which were based upon the inspection behavior theory of Rothkopf (1963, 1965) and the

attention theory of retardate learning (House and Zeaman, 1960; Zeaman and House, 1963). According to Rothkopf (1965), the use of adjunct questions in written prose materials serves to induce mathemagenic behavior. House and Zeaman (1960) and Zeaman and House (1963) have emphasized the importance of engineering the attention of the retardate toward the relevant characteristics of the learning material before learning can occur. They have preferred to hypothesize an attention deficit instead of a learning deficit on the part of the retardate in two-choice, simultaneous, visual discrimination learning tasks.

Therefore, two major extensions occurred in the present study. One was the use and investigation in aural prose of those variables found to be influential in the facilitation of the retention of information in written prose. The other major extension was the use and investigation of a signal designed to gain the attention of the trainable mental retardate in an aural prose learning task as opposed to a two-choice, simultaneous, visual discrimination learning task.

Seventy-two trainable mentally retarded students were individually read a 10 paragraph prose passage via one of six presentation methods which manipulated the location of adjunct questions and a procedure designed to gain the attention of the

retarded Ss. The same 30 item criterion test was administered to each S immediately following each of the three readings of the prose passage. The criterion test consisted of 15 three-foil multiple choice relevant questions and 15 three-foil multiple choice incidental questions. The relevant questions pertained to information in the passage to which the S's attention had been directed by means of a special procedure and were identical to adjunct questions which some Ss heard during the reading of the passage. The Ss attention was not directed toward the information in the passage which answered the incidental questions and these questions were not heard by any S during passage presentation. Immediate, 100 per cent reinforcement, in the form of M & M candies, was used for all Ss during the first three administrations of the criterion test.

A measure of delayed retention was also included. The criterion test, the passage via the control condition, and the criterion test were individually administered to each S one week following the three initial administrations of the passage and criterion tests. No reinforcement was used during the delayed retention segment of the study.

Analysis of covariance was used to analyze the $2 \times 3 \times 5 \times 2$ factorial design with repeated measures on the last two factors. The first factor, cueing, consisted of two levels--no cueing and cueing.

The second factor was question location and consisted of three levels--no questions, questions after each paragraph and questions before each paragraph. The third factor represented the five administrations of the same criterion test and the levels of the fourth factor, information, were relevant and incidental. The covariable was the total number correct answers to questions immediately following the reading of each of three short pre-passages. The dependent variable was the number of correct relevant and incidental questions for each administration of the criterion test.

The repeated measures analysis of covariance revealed no significant differences due to between Ss sources of variation. The main effect of Cueing, the main effect of Question Location, and the interaction of Cueing and Question Location were not significant. However, within Ss sources of variation due to the main effect of Time, the main effect of Information, and the interaction of Time and Information were significant.

Post hoc investigations of the significant main effect of Time indicated that (1) more questions were answered correctly on both the third and fifth administration of the criterion test than on the first administration and that (2) there was no difference between initial and delayed retention. The significant main effect of

Information showed that the retention of relevant information was better than the retention of incidental information. A posteriori investigations of the significant interaction of Time and Information indicated (1) no pairwise differences in relevant information between each administration of the criterion test, (2) that more incidental questions were answered correctly at each of the second, third, fourth, and fifth administrations of the criterion test than on the first administration, and (3) that more relevant than incidental questions were answered correctly only on the first administration of the criterion test.

Therefore, it was concluded that trainable mentally retarded students presented with an aural prose learning task via a procedure designed to gain attention and/or adjunct questions (1) did not benefit from any of the six presentation methods; (2) were not facilitated in the retention of factual information via the procedure designed to gain attention; (3) were not facilitated in the retention of factual information via adjunct questions, regardless of location; (4) retained relevant information better than incidental information and (5) retained as much relevant and/or incidental information one week following the original presentations as they did immediately following the original presentations.

The finding that the procedure designed to gain attention did not facilitate the retardate's retention of factual information was discussed in association with the attention theory of retardate learning (House and Zeaman, 1960; Zeaman and House, 1963). It was suggested that (1) the procedure designed to gain attention may have diverted the S's attention instead of directing it toward the relevant aspects of the material to be learned, (2) the trainable mental retardate may only be able to attend to a limited amount of information at one time, and (3) the trainable mentally retarded individual may possess a limited capacity for retention of correctly recalled information. However, further analyses of the trainable mental retardate's variability on relevant new correct responses and relevant incorrect responses previously correct did not support the aforementioned hypotheses.

The finding that adjunct questions, regardless of location, did not facilitate the retardate's retention of factual information was discussed in association with the behavior theory of Rothkopf (1963). It was suggested that both pre- and post-questions may have diverted the trainable mental retardate's attention rather than focusing his attention on relevant material within the passage. Further analyses indicated that both pre- and post-question treatment groups were more variable in relevant new correct responses than no-question

treatment groups and that pre-question treatment groups were more variable than no-question treatment groups in incidental new correct responses.

Recent research (Frase, Patrick and Schumer, 1970) has shown no differences to occur between pre-, post-, and no-question groups due to high inventive levels. This was discussed in lieu of the fact that 100 per cent reinforcement was used in the present study.

Three specific studies were implicated for future research efforts in aural prose learning tasks. Two of these would involve use of the exact methodology and materials found in the present study. One of these two studies would have normal first grade children as Ss and the other would have educable mental retardates as Ss. The third proposed research effort in aural prose learning would be conducted with college students and involve a delayed retention measure.

Finally, the limitations of current theorizing with respect to retardate learning of an aural prose task were discussed. Future researchers were cautioned against generalizing from specific methodologies and the manipulations of specific independent variables found to be influential in the learning of written prose materials by college Ss.

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APPENDICES

APPENDIX A

INDIVIDUAL CHRONOLOGICAL AGES AND INTELLIGENCE QUOTIENTS

	I (P)		II (P*)		III (PQ)	
Ss	CA	IQ	CA	IQ	CA	IQ
1	14.17	48	17.58	36	14.92	51
2	17.92	37	18.92	36	15.00	53
3	19.00	46	15.67	32	13.58	44
4	21.25	51	20.83	30	13.42	45
5	14.17	35	18.42	61	16.17	34
6	14.25	46	14.75	54	18.67	30
7	17.75	41	21.50	40	15.25	55
8	19.83	30	14.75	37	12.58	50
9	20.58	43	12.83	44	15.75	63
10	17.58	47	16.50	54	12.50	39
11	11.67	46	16.83	52	17.00	44
12	21.42	40	16.17	45	16.00	46

	IV (PQ*)		V (QP)		VI (QP*)	
Ss	CA	IQ	CA	IQ	CA	IQ
1	12.25	47	16.67	51	11.67	51
2	14.08	56	14.75	37	13.58	44
3	15.17	50	18.17	54	18.33	46
4	19.00	50	13.67	40	12.00	50
5	18.17	51	18.92	46	18.08	34
6	18.33	30	15.33	46	20.83	48
7	17.67	42	13.33	53	13.67	45
8	13.83	46	15.67	44	14.75	53
9	17.75	56	18.50	51	16.17	60
10	16.50	49	15.17	38	15.67	55
11	18.58	47	15.00	44	14.75	42
12	14.17	44	12.67	44	15.75	48

APPENDIX B

THE THREE PRE-PASSAGES

Pre-passage one:
"They Walk at Night"

Some people walk in their sleep. They get out of bed and walk around the house. Then they go back to bed. People who talk in their sleep are called sleepwalkers.

Sleepwalkers do funny things. One woman got out of bed and began to cook food. She mad a fine meal while still asleep.

Some sleepwalkers even walk out of their homes. One little boy walked out of his house. He walked until he came to a river. Into the water he jumped.

One man got up in the night. He went out and cut down a tree. Back to bed he went. In the morning he got up again. There was the tree on the ground.

People say that sleepwalkers do not get hurt. This is not so. Sleepwalkers can fall. One man fell from the top of his house. He got up on the roof in his sleep!

Pre-passage two:
"The King"

The king of all animals is not the big elephant. It is not the lion. It is an animal that is not big at all. It is an animal that is very small. It is the little fly called a flea.

There is no such thing as a lion circus or an elephant circus. There is a circus with just fleas in it. It is called a flea circus.

In two weeks time the flea can get ready for the circus. It can learn to pull wagons. It can learn to kick a ball. It can even learn to dance.

The flea is dressed. Sometimes it is dressed like a boy or girl. Sometimes a gold collar is put around its neck. It must look its very best.

The flea cannot fly, but it is the best jumper there is. If a boy could jump as well for his size, he could jump right over his house.

Pre-passage three:
"Funny Trees"

No one can get up the trunk of the Banana Tree. No one can try to do it. Do you know why? The Banana Tree has no trunk.

One tree looks like a puff of smoke. This tree has no leaves. It's gray in color. Guess what it is called. It is called the Smoke Tree.

Can you picture a tree with more than one trunk? Can you picture a tree with ten trunks? There is a tree with 200 trunks. It is called the Banyan Tree.

There is one tree that looks like it' s going to sleep. It doesn' t grow up. It only grows sideways. It looks like it is going to fall down. It is called the Tired Tree.

You can' t put your arms around one tree. It takes 30 men. All must hold hands to reach around its trunk. We call it the Fat Tree.

APPENDIX C

THE TEST PASSAGE: "A TRIP TO THE BEACH"

One Saturday the sun was shining. **Father did not have to work that day. He was home. So, the Blackman family decided to take a trip.

**Father asked mother to make sandwiches to take with them. **They were going to have a picnic. But, there was not enough food. So, mother went to the grocery store.

Mother drove the car. **The store was six blocks away. She bought bread, baloney and apples. Mother also bought cupcakes to eat after lunch. She spent three dollars.

Mother began to make lunch. **Carol helped make the lunch. **They also made lemonade to drink. They put the lunch in a box.

**Father carried the lunch to the car. The family got in the car and drove away. They only drove one block. **Bill had forgotten his baseball. So, father turned the car around. It took two minutes to go back to the house.

The family drove to a beach. They ate their lunch first. **During lunch, Bill dropped his apple in the sand. But, mother had another one for him. After lunch, they played baseball.

All of the family played. **Father threw the ball to the batter. Bill and Carol took turns batting. Bill hit a home run. Carol did not hit a home run. **Mother caught the ball.

After playing baseball, the family went swimming. **They swam for a long time. Mother was the best swimmer. Carol was just learning to swim.

The family walked up and down the beach after swimming. **They looked for shells. They put them in a bucket. Carol found a pink one. She kept it in her pocket.

It was time to go home. They had stayed at the beach all day. **Bill fell asleep on the way home. But, he woke up when they stopped. They stopped at a restaurant. **All of the family had cokes. They got home when it was dark.

**--Asterisks indicate the places where the experimenter grasped the shoulder of the subject and said, "Now listen" to subjects in groups II(P*), IV (PQ*) and VI (QP*).

APPENDIX D

QUESTIONS FOR THE PRE-PASSAGES

Questions for pre-passage one: "They Walk at Night"

1. People who walk in their sleep are called:
2. When asleep one woman:
3. One boy jumped into a:
4. A man cut a:
5. Sometimes those who walk when asleep get:

Questions for pre-passage two: "The King"

1. The kind of all animals is the:
2. There is a circus just for:
3. The flea learns to:
4. The fleas learn many things in two:
5. The flea cannot:

Questions for pre-passage three: "Funny Trees"

1. The Banana Tree has no:

2. The Smoke Tree is:

3. A tree with many trunks is the:

4. One tree looks like it is going to:

5. To reach around the Fat Tree it takes:

APPENDIX E

CRITERION TEST QUESTIONS

1. What day was the sun shining?

*2. Who did not have to work that day?

3. What was the name of the family?

*4. What did father ask mother to make?

*5. What were they going to have?

6. Where did mother go?

*7. How far away was the store?

8. What did mother buy to eat after lunch?

9. How much money did mother spend?

*10. Who helped mother make the lunch?

*11. What did they make to drink?

12. What did they put the lunch in?

*13. Who carried the lunch to the car?

*14. What had Bill forgotten?

15. How long did it take to go back to the house?

16. What did they do first?

*17. Whad did Bill drop during lunch?

18. When did they play baseball?

*19. Who threw the ball to the batter?

20. Who hit a home run?

*21. Who caught the ball?

*22. How long did they swim?

23. Who was the best swimmer?

24. Who was just learning to swim?

*25. What did they look for on the beach?

26. What did they put them in?

27. What was the color of the one Carol found?

*28. Who fell asleep on the way home?

29. Where did they stop?

*30. What did all of the family have?

---

*--Asterisks indicate relevant questions.

APPENDIX F

ORDERS OF ANSWERS FOR PRE-PASSAGE ONE:

"THEY WALK AT NIGHT"

Question	Administration 1	Administration 2	Administration 3
1.	nightwalkers	sleepwalkers	sleepers
	sleepers	sleepers	sleepwalkers
	sleepwalkers	nightwalkers	nightwalkers
2.	read	ate	cooked
	cooked	cooked	ate
	ate	read	read
3.	boat	river	car
	car	car	river
	river	boat	boat
4.	tree	cake	rope
	rope	rope	cake
	cake	tree	tree
5.	hurt	lost	sick
	sick	sick	lost
	lost	hurt	hurt

APPENDIX G

ORDERS OF ANSWERS FOR PRE-PASSAGE TWO:

"THE KING"

Question	Administration 1	Administration 2	Administration 3
1.	lion	flea	elephant
	elephant	elephant	flea
	flea	lion	lion
2.	birds	fleas	dogs
	dogs	dogs	fleas
	fleas	birds	birds
3.	talk	sing	kick
	kick	kick	sing
	sing	talk	talk
4.	days	weeks	years
	years	years	weeks
	weeks	days	days
5.	fly	eat	jump
	jump	jump	eat
	eat	fly	fly

APPENDIX H

ORDERS OF ANSWERS FOR PRE-PASSAGE THREE:

"FUNNY TREES"

Question	Administration 1	Administration 2	Administration 3
1.	trunk	leaves	bananas
	bananas	bananas	leaves
	leaves	trunk	trunk
2.	green	gray	blue
	blue	blue	gray
	gray	green	green
3.	Banyan	Elephant	Baby
	Baby	Baby	Elephant
	Elephant	Banyan	Banyan
4.	play	sleep	run
	run	run	sleep
	sleep	play	play
5.	30 men	5 men	2 men
	2 men	2 men	5 men
	5 men	30 men	30 men

APPENDIX I

VOCABULARY CHECKLIST

	knows	doesn't know
Make believe you forgot your coat this morning. Where did you leave it?		
Make believe you're playing baseball and you hit a home run. What does that mean? (How far around the bases would you get to run?)		
What do you do in a restaurant?		
What do you wear when you go swimming?		
What do you do on a picnic?		
You're walking along the beach and you find some shells. What are shells? What do they look like? Color? Size?		
What do you buy in a grocery store?		
What is a bucket?		
What are sandwiches?		
What do you do with lemonade?		

Note: The underlined words indicate the vocabulary concepts of interest.

APPENDIX J

INSTRUCTIONS FOR EACH TREATMENT GROUP

Group I (P)

"Today we are going to listen to a story. I will read the story to you three times.

"After I read all of the story, I am going to ask you questions about the story. Listen carefully to the story so you will be able to answer the questions I ask you. Are you ready, (child's name)? O.K. Now I will read the story for the first time. Remember to listen carefully so you will be able to answer the questions I ask you at the end of the story."

Group II (P*)

"Today we are going to listen to a story. I will read the story to you three times. Sometimes I will say, 'Now listen.' When I say 'Now listen,' I want you to listen carefully to the next sentence I read.

"After I read all of the story, I am going to ask you questions about the story. Listen carefully to the story so you will be able to answer the questions I ask you. Are you ready, (child's name)? O.K. Now I will read the story for the first time. Remember to listen carefully so you will be able to answer the questions I ask you at the end of the story."

Group III (PQ)

"Today we are going to listen to a story. I will read the story to you three times. I will also read some questions after each paragraph. When I read these questions, I want you to try to answer them.

"After I read all of the story, I am going to ask you questions about the story. Listen carefully to the story so you will be able to answer the questions I ask you. Are you ready, (child's name)? O.K. Now I will read the story for the first time. Remember to listen carefully so that you will be able to answer the questions I ask you at the end of the story."

Group IV (PQ*)

"Today we are going to listen to a story. I will read the story to you three times. Sometimes I will say, 'Now listen.' When I say 'Now listen,' I want you to listen carefully to the next sentence I read. I will also read some questions after each paragraph. When I read these questions, I want you to try to answer them.

"After I read all of the story, I am going to ask you questions about the story. Listen carefully to the story so you will be able to answer the questions I ask you. Are you ready, (child's name)? O.K. Now I will read the story for the first time. Remember to listen carefully so you will be able to answer the questions I ask you at the end of the story."

Group V (QP)

"Today we are going to listen to a story. I will read the story to you three times. I will also read some questions before each paragraph. When I read the paragraph, I want you to try to answer the questions.

"After I read all of the story, I am going to ask you questions about the story. Listen carefully to the story so you will be able to answer the questions I ask you. Are you ready,

(child's name)? O.K. Now I will read the story for the first time. Remember to listen carefully so you will be able to answer the questions I ask you at the end of the story."

Group VI (QP*)

"Today we are going to listen to a story. I will read the story to you three times. Sometimes I will say, 'Now listen.' When I say 'Now listen,' I want you to listen carefully to the next sentence I read. I will also read some questions before each paragraph. When I read the paragraph, I want you to try to answer the questions.

"After I read all of the story, I am going to ask you questions about the story. Listen carefully to the story so you will be able to answer the questions I ask you. Are you ready, (child's name)? O.K. Now I will read the story for the first time. Remember to listen carefully so you will be able to answer the questions I ask you at the end of the story."

APPENDIX K

ORDERS OF ANSWERS FOR INITIAL CRITERION TESTS

Question	Administration 1	Administration 2	Administration 3
1.	Friday	Saturday	Sunday
	Saturday	Friday	Saturday
	Sunday	Sunday	Friday
2.	Father	Mother	Uncle Jim
	Mother	Father	Mother
	Uncle Jim	Uncle Jim	Father
3.	Carson	Daniels	Blackman
	Daniels	Carson	Daniels
	Blackman	Blackman	Carson
4.	a cake	sandwiches	cookies
	sandwiches	a cake	sandwiches
	cookies	cookies	a cake
5.	a talk	a new dog	a picnic
	a new dog	a talk	a new dog
	a picnic	a picnic	a talk
6.	grocery store	gas station	post office
	gas station	grocery store	gas station
	post office	post office	grocery store
7.	1 block	10 blocks	6 blocks
	10 blocks	1 block	10 blocks
	6 blocks	6 blocks	1 block

Question	Administration 1	Administration 2	Administration 3
8.	cookies	cupcakes	pies
	cupcakes	cookies	cupcakes
	pies	pies	cookies
9.	$5	$10	$3
	$10	$5	$10
	$3	$3	$5
10.	Carol	Father	Bill
	Father	Carol	Father
	Bill	Bill	Carol
11.	ice tea	lemonade	kool-aid
	lemonade	ice tea	lemonade
	kool-aid	kool-aid	ice tea
12.	a basket	a paper bag	a box
	a paper bag	a basket	a paper bag
	a box	a box	a basket
13.	Father	Bill	Carol
	Bill	Father	Bill
	Carol	Carol	Father
14.	his swimsuit	his baseball	his jacket
	his baseball	his swimsuit	his baseball
	his jacket	his jacket	his swimsuit
15.	10 minutes	5 minutes	2 minutes
	5 minutes	10 minutes	5 minutes
	2 minutes	2 minutes	10 minutes
16.	ate lunch	went swimming	played baseball
	went swimming	ate lunch	went swimming
	played baseball	played baseball	ate lunch
17.	his sandwich	his cookie	his apple
	his cookie	his sandwich	his cookie
	his apple	his apple	his sandwich

Question	Administration 1	Administration 2	Administration 3
18.	after lunch	before lunch	after supper
	before lunch	after lunch	before lunch
	after supper	after supper	after lunch
19.	Mother	Father	Bill
	Father	Mother	Father
	Bill	Bill	Mother
20.	Bill	Carol	Mother
	Carol	Bill	Carol
	Mother	Mother	Bill
21.	Carol	Mother	Bill
	Mother	Carol	Mother
	Bill	Bill	Carol
22.	a little while	an hour	a long time
	an hour	a little while	an hour
	a long time	a long time	a little while
23.	Mother	Bill	Father
	Bill	Mother	Bill
	Father	Father	Mother
24.	Bill	Carol	Mother
	Carol	Bill	Carol
	Mother	Mother	Bill
25.	shells	rocks	pebbles
	rocks	shells	rocks
	pebbles	pebbles	shells
26.	a box	a bucket	a basket
	a bucket	a box	a bucket
	a basket	a basket	a box
27.	pink	orange	white
	orange	pink	orange
	white	white	pink

Question	Administration 1	Administration 2	Administration 3
28.	Carol	Mother	Bill
	Mother	Carol	Mother
	Bill	Bill	Carol
29.	at a restaurant	at a friend's house	at church
	at a friend's house	at a restaurant	at a friend's house
	at church	at church	at a restaurant
30.	cokes	sundaes	hot dogs
	sundaes	cokes	sundaes
	hot dogs	hot dogs	cokes

APPENDIX L

ORDERS OF ANSWERS FOR THE DELAYED CRITERION TEST

Question	Administration 1	Administration 2
1.	Friday	Sunday
	Sunday	Friday
	Saturday	Saturday
2.	Father	Uncle Jim
	Uncle Jim	Father
	Mother	Mother
3.	Carson	Blackman
	Blackman	Carson
	Daniels	Daniels
4.	a cake	cookies
	cookies	a cake
	sandwiches	sandwiches
5.	a talk	a picnic
	a picnic	a talk
	a new dog	a new dog
6.	grocery store	post office
	post office	grocery store
	gas station	gas station
7.	1 block	6 blocks
	6 blocks	1 block
	10 blocks	10 blocks

Question	Administration 1	Administration 2
8.	cookies	pies
	pies	cookies
	cupcakes	cupcakes
9.	$5	$3
	$3	$5
	$10	$10
10.	Carol	Bill
	Bill	Carol
	Father	Father
11.	ice tea	kool-aid
	kool-aid	ice tea
	lemonade	lemonade
12.	a basket	a box
	a box	a basket
	a paper bag	a paper bag
13.	Father	Carol
	Carol	Father
	Bill	Bill
14.	his swimsuit	his jacket
	his jacket	his swimsuit
	his baseball	his baseball
15.	10 minutes	2 minutes
	2 minutes	10 minutes
	5 minutes	5 minutes
16.	ate lunch	played baseball
	played baseball	ate lunch
	went swimming	went swimming
17.	his sandwich	his apple
	his apple	his sandwich
	his cookie	his cookie

Question	Administration 1	Administration 2
18.	after lunch	after supper
	after supper	after lunch
	before lunch	before lunch
19.	Mother	Bill
	Bill	Mother
	Father	Father
20.	Bill	Mother
	Mother	Bill
	Carol	Carol
21.	Carol	Bill
	Bill	Carol
	Mother	Mother
22.	a little while	a long time
	a long time	a little while
	an hour	an hour
23.	Mother	Father
	Father	Mother
	Bill	Bill
24.	Bill	Mother
	Mother	Bill
	Carol	Carol
25.	shells	pebbles
	pebbles	shells
	rocks	rocks
26.	a box	a basket
	a basket	a box
	a bucket	a bucket
27.	pink	white
	white	pink
	orange	orange

Question	Administration 1	Administration 2
28.	Carol	Bill
	Bill	Carol
	Mother	Mother
29.	at a restaurant	at church
	at church	at a restaurant
	at a friend's house	at a friend's house
30.	cokes	hot dogs
	hot dogs	cokes
	sundaes	sundaes

APPENDIX M

DEPENDENT VARIABLES AND COVARIABLE

Ss	T1		T2		T3		T4		T5		Covariable
	R	I	R	I	R	I	R	I	R	I	
Treatment Group I (P)											
1	9	7	7	8	8	8	9	10	9	8	14
2	5	3	6	5	6	6	5	4	8	8	19
3	14	13	11	11	11	10	11	9	13	11	20
4	15	14	14	15	15	15	15	15	15	15	37
5	7	4	7	7	5	7	7	6	9	6	15
6	12	13	14	15	15	14	15	15	15	15	32
7	7	5	9	4	10	7	9	8	6	8	16
8	5	5	5	4	6	6	5	8	4	5	20
9	9	7	8	8	8	11	11	9	12	12	21
10	13	12	14	12	14	13	15	13	15	14	22
11	11	12	12	12	14	13	13	13	13	14	22
12	13	14	12	14	15	15	11	15	15	14	41
Treatment Group II (P*)											
1	8	5	5	6	7	3	6	7	3	3	16
2	4	5	6	8	4	7	4	3	4	2	12
3	7	5	6	5	5	6	5	6	4	3	17
4	10	9	8	8	7	3	10	8	7	7	13
5	10	10	15	12	11	13	14	13	14	13	31
6	9	9	11	9	10	9	10	10	10	9	35
7	9	8	11	10	9	12	10	12	12	11	18
8	9	4	6	8	6	4	5	6	8	8	18
9	12	11	11	11	10	11	11	10	11	11	21
10	12	12	15	10	15	13	15	11	14	10	18
11	6	5	7	7	2	4	4	3	4	6	17
12	11	10	12	11	12	12	13	14	15	13	26

Ss	T1		T2		T3		T4		T5		Covariable
	R	I	R	I	R	I	R	I	R	I	
Treatment Group III (PQ)											
1	14	13	14	14	14	12	15	11	14	12	43
2	13	10	14	13	13	14	12	11	13	11	13
3	10	9	13	13	15	12	14	12	15	15	29
4	9	5	13	8	11	7	9	7	11	7	18
5	6	5	5	5	6	7	5	4	5	4	18
6	7	3	8	5	11	8	9	6	10	8	10
7	14	12	15	12	15	13	15	14	15	14	17
8	11	8	14	7	13	7	14	7	11	7	17
9	14	13	15	14	15	14	15	14	15	14	42
10	7	5	7	7	7	8	4	5	6	4	17
11	11	12	13	13	11	14	11	12	12	13	25
12	13	13	14	15	14	15	13	15	15	15	27
Treatment Group IV (PQ*)											
1	7	4	5	6	7	5	5	7	8	5	15
2	10	11	12	10	13	12	12	11	12	11	26
3	10	5	10	5	7	9	7	6	6	6	17
4	7	9	9	8	9	7	6	6	8	6	18
5	10	8	11	9	11	11	9	10	13	13	16
6	13	7	13	8	12	10	11	6	11	9	25
7	8	5	7	6	7	9	8	6	10	9	22
8	13	14	15	11	14	12	15	11	15	9	23
9	13	12	14	14	14	14	14	14	15	15	40
10	14	14	14	14	15	13	14	12	15	14	16
11	5	4	5	5	6	7	8	7	10	7	19
12	10	9	9	9	14	11	9	6	10	11	19

Ss	T1		T2		T3		T4		T5		Covariable
	R	I	R	I	R	I	R	I	R	I	
Treatment Group V (QP)											
1	14	13	14	14	12	14	13	14	12	15	34
2	5	6	6	6	6	4	5	4	5	5	10
3	13	11	13	13	14	14	14	14	15	15	44
4	10	6	4	7	5	4	9	8	6	5	14
5	14	12	15	13	15	15	14	14	15	15	26
6	12	8	15	12	13	14	14	13	15	13	19
7	11	8	12	10	13	11	12	10	15	10	16
8	12	13	13	14	14	14	13	14	13	14	29
9	11	10	14	14	15	15	14	14	14	15	33
10	13	6	13	5	12	9	13	6	13	6	23
11	6	5	9	7	11	11	9	7	10	7	18
12	11	7	14	8	14	9	12	10	12	7	16
Treatment Group VI (QP*)											
1	11	9	12	8	11	10	12	11	11	9	26
2	8	6	9	10	10	11	8	10	13	10	20
3	7	8	10	9	9	9	6	5	8	7	16
4	12	11	12	11	12	12	10	11	10	10	15
5	5	4	5	5	9	10	7	7	10	9	18
6	12	4	12	6	13	7	12	7	13	8	17
7	13	8	12	10	13	9	13	10	13	10	19
8	10	5	9	8	11	9	11	6	10	11	25
9	15	14	15	15	15	15	15	15	15	15	43
10	14	12	15	15	15	15	14	13	13	15	40
11	6	5	6	4	7	7	4	4	3	7	17
12	8	5	8	5	5	7	7	5	6	4	26