DOCUMENT RESUME

ED 105 475 CS 202 001

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TITLE	Comprehension of a Narrative Passage by Fifth Grade Children as a Function of Listening Rate and Presentation Strategy; IMRID Papers, Volume V, No. 3.
INSTITUTION	George Peabody Coll. for Teachers, Nashville, Tenn. Inst. on Mental Retardation and Intellectual Development.
SPONS AGENCY	National Inst. of Child Health and Human Development (NIH), Bethesda, Md.
PUB DATE	68
NOTE	22p.
EDRS PRICE	MF-$0.76 HC-$1.58 PLUS POSTAGE
DESCRIPTORS	Aural Learning; Educational Research; Elementary Education; Grade 5; *Learning Theories; *Listening Comprehension; *Listening Skills; *Speech Compression; *Time Factors (Learning)

ABSTRACT

This study investigated learning through listening at rates ranging from 178 to 378 words per minute. Three presentation strategies--a single presentation, a double presentation, and a double presentation with a one-week interval between the presentations--were compared. Immediate and one-week retention data were gathered on each subject. Ninety-eight fifth grade children of average intelligence comprised the sample. Results of the study indicated relatively small differences among the rates or presentation strategies used in this study with respect to effectiveness and efficiency of learning. Thus this study would not support the hypothesis that pupils who listen twice at high rates of speed would be exposed to a more efficient learning situation than would students who listen to the same material once at a slower rate of speed. Of the treatment combinations used in this study, listening once at 278 words per minute resulted in the highest performance when evaluated with respect to learning efficiency. (Author)

IMRID Volume V, No. 3
1968

COMPREHENSION OF A NARRATIVE PASSAGE BY FIFTH GRADE CHILDREN AS A FUNCTION OF LISTENING RATE AND PRESENTATION STRATEGY[1]

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While extensive research has been conducted to determine what kinds of methods result in maximum efficiency in learning through reading, a minimum of attention has been focused on learning through listening. Wilt and Markgraf (1966) have ascertained that more than 50 per cent of the time spent by students in school learning situations is devoted to listening. Although a great deal of material to be learned is transmitted orally, teachers frequently observe that children learn little by listening. Possibly they find tedious the process of obtaining information through listening because the normal speaking rates of 125 to 175 words per minute may be slower than the brain's processing rate. Nichols (1957) describes the inefficiency of learning through listening as a problem in which many listeners, capable of processing messages at rates much faster than they receive them at the normal speaking rate, fill in time between messages with other thoughts. If this is the case, several advantages may accrue to many learners when spoken information is presented to them at higher than normal speech rates, such as, 1) the obvious advantage that more information is transmitted to them per unit of time; and 2) the side effect that their attention to the information is increased as a result of the message being presented at a rate nearer to the learners' processing capability.

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[1]The research reported herein was supported by Grant HD 973 from the National Institute of Child Health and Human Development.

The technology of "time compressed and expanded recording" makes possible the reproduction of recorded materials at faster and slower rates of speed without the usual accompanying audio distortions. Rates as high or higher than 300 to 400 words per minute can easily be obtained through the process of compression as well as rates slower than normal, such as 75 words per minute, which are obtained by expansion. Such time compression and expansion of recorded materials requires laboratory equipment which is available in very few locations in the United States; however, the technology has advanced to the point where feasible applications to education should be explored.

Since most of the experimentation to date has been with adults, more research needs to be conducted with children before specific applications can be proposed and developed. Woodcock and Clark (1968) investigated learning through listening at rates ranging from 78 to 428 words per minute (wpm) with 162 elementary school children from three levels of intelligence comprising the sample. Immediate and one-week retention data were gathered on each subject. Results of this study indicate that listening rates of 228 and 278 words per minute are more efficient for learning and retention than the normal rate of 178 words per minute. They conclude that their study provides evidence that high-speed listening can be an efficient learning medium for elementary school children.

The procedure used by Woodcock and Clark involves a single presentation of the passage to the learner. It is reasonable to assume that performance at the higher listening rates would be enhanced by a procedure which provides for the reviewing of the material, perhaps through as simple a means as that of

doubling the presentation of the passage to the subject. Furthermore, the time required for listening once to the passage at 175 wpm would be the same as that required for listening twice to the passage presented at 350 wpm. Which of these two presentation strategies would yield the greatest amount of learning? No studies reported in the literature on compressed speech have dealt with this question.

Purpose

The purpose of this study was to evaluate differences in comprehension among fifth grade children of average intelligence who listened to a passage presented at four rates of compression ranging from 178 wpm to 378 wpm. The results from learning through this medium were studied further with respect to retention time and presentation strategy. Figure 1 portrays the design of the study.

Figure 1 about here

Table 1 shows the differences between the three presentation strategies. The "single presentation" groups were administered the entire SLP tape in the standard fashion. The "double presentation" groups relistened to the story passage a second time immediately before they took the test portion of the SLP. The "split-double presentation" groups only listened to the passage and were not tested at the first sitting. One week later these subjects returned to the experimental setting, relistened to the passage, and then took the test. The

procedure for the second sitting was identical to the normal SLP procedure. One week after they took Form A of the test, all subjects were administered the alternate form, Form B, over the criterion passage.

Table 1 about here

It was predicted that learning through listening would be greater at the lower rates than at the higher rates used in this study. It was also predicted that one-week retention scores would be lower than immediate retention scores, and that retention would be a function of presentation strategy with the single presentation being the least efficient presentation and the split-double presentation being the most efficient presentation. No interactions among rate, retention period, or presentation strategy were predicted. The immediate and one-week retention measures were obtained from two alternate forms of a 28-item multiple choice test covering the content of the narrative passage.

Method

Subjects

A sample of 84 students having average intelligence was drawn from fifth grade classes during the fall of 1967. All subjects had mental ages falling within the range of 9 years 4 months (9-4) to 11 years 3 months (11-3) as measured by the Peabody Picture Vocabulary Test (PPVT) (Dunn, 1959). The subjects were randomly assigned into 12 treatment groups containing 7 subjects

each. These groups listened at rates of either 178, 278, 328, or 378 wpm. In addition, a comparison group of 14 subjects was administered the test over the passage content without their having listened to the passage. None of the 98 subjects had previous experience with compressed speech.

Materials

The materials used in this study were the Standardized Listening Passages (SLP) prepared by Clark and Woodcock (1967). Three passages, each of which is recorded at speeds of 178,278,328, and 378 wpm, were used along with their associated tests. The contents of the three passages are concerned with the historical-legendary figures of Marco Polo, Dick Whittington, and Roland. The first two passages were used for training and familiarization purposes, and the "Roland" passages for obtaining criterion data, as prescribed by the standardized procedure.

The "Marco Polo" passage is 1,053 words in length with a listening time of 6.0 minutes at the original recorded rate of 178 wpm. "Dick Whittington and his Cat" is 1,470 words in length and requires 7.9 minutes of listening time at the 178 wpm rate. The "Roland" passage is 2,807 words in length and requires 15.0 minutes of listening time at the 178 wpm rate. The passages have been re-recorded at compressed rates with the listening times of the passages changed proportionately. Multiple choice tests covering the passage content were used in this study. Each test for the two training passages contained ten items, and two alternate forms of a 28-item tests were used with the "Roland" passage.

Each SLP tape consists of the following portions:

1. Instructions to the subject regarding the earphones and adjustment of volume to each ear.
2. Instructions regarding the listening task to be presented.
3. The passage at the appropriate wpm rate.
4. Instructions to the subject for taking the test.
5. The multiple choice test over the content of the passage.

The SLP tapes used with the comparison groups, who did not listen to the passages, do not include sections "2" and "3" above. All instructions and tests are presented at the normal speech rate on the SLP tapes; the passage section of an SLP tape is the only portion which is compressed or expanded.

Procedure

The sequence of steps in selecting the subjects was as follows:

1. Pupils enrolled in the fifth grade classes in several elementary schools were administered Form B of the PPVT. The standardized procedure for administering this test was modified in order to allow for group administration.
2. The pupils meeting the mental age range criterion were randomly assigned into the 12 treatment groups and the comparison group.

The sequence of steps in conducting the training sessions and the experimental sessions was as follows:

1. Subjects were brought, in groups of four or eight, to the library of their school where the experimental apparatus had been arranged. A 1' x 2' Masonite screen was placed between each pair of subjects sitting face-to-face in order to minimize the opportunity to copy during the testing portion of the procedure. The subjects were told that they would listen to a story through the earphones. They were shown their volume controls and instructed to put on the earphones. All subsequent instructions to the subjects were transmitted by tape for the remainder of the session.

2. The tape for the first training session, "Marco Polo," was played. The listening time for playing the passage once ranged from 6.0 to 2.8 minutes, depending upon the rate of compression.

   The "single presentation" groups took the test immediately, according to the sequential procedure of the tape. During the taped presentation of instructions for the test, the experimenters distributed a copy of the test and a pencil to each subject. As the test items were presented on the tape, the subjects followed on their printed test forms and selected answers. At the completion of the test, the SLP tape instructed the subjects to remove their earphones. The subjects then returned to their classrooms. The entire listening time, from the initial adjustment of earphones to the removal of earphones, was approximately eight minutes more than the listening time for the passage.

   Subjects assigned to "double presentation" groups listened to the first three portions of the tape, that is, through the "Marco Polo" passage. The tape was then stopped and the passage was played a second time. After the second listening, the subjects were administered the test.

   The subjects assigned to the "split-double presentation" groups had their first session terminated at the end of the listening passage, without being tested on this initial listening. One week later this group returned and went through the procedure of listening to the passage once and then took the test.

3. The same procedure described above for each of the presentations was repeated at the second training session in the afternoon, using the "Dick Whittington and his Cat" SLP tapes. The listening time for playing this passage once ranged from 7.9 to 3.7 minutes. The total time for the session required eight minutes in addition to the listening time for the passage.

4. The next day the procedure, now well established, was repeated with the subjects listening to the "Roland" passage on which the criterion data was collected. The subjects were unaware that this session had any significance beyond that of the two preceeding sessions. Listening time for playing the "Roland" passage once ranged from 15.0 to 7.1 minutes. The total time required for the session was an additional 15 minutes, since, for the "Roland" tapes, the test contained 28 rather than 10 items. The test, Form A, was administered in accordance with the established procedure, with the "single presentation" groups taking the test immediately after listening once to the passage, the "double presentation" groups taking it after listening twice, and the "split-double presentation" groups not taking their test until one week had elapsed.

5. All subjects were administered Form B of the "Roland" test one week after they had taken Form A. The procedure was the same as before, except that none of the subjects listened to the passage.

6. The criterion tests were scored by the experimenters. Raw scores were converted into normalized T-scores using the norms provided by Clark and Woodcock (1967).

Results

Table 2 presents the mean CA, MA, and IQ for each of the twelve treatment groups. An analysis of variance indicated no significant differences at the .05 level among the treatment groups in respect to these three subject characteristics.

Table 2 about here

Table 3 presents the immediate and one-week criterion data for each of the treatment groups. Data are reported as mean T-scores for each group. Figure 2 graphically portrays the immediate retention data, and Figure 3 portrays the one-week retention data. These criterion data were analyzed by a Lindquist Type 3 analysis of variance. Table 4 presents the results of this analysis. Significant differences were found which are attributable to rate ($p < .001$) and to a rate by retention period interaction ($p < .001$). There were no significant differences at the .05 level due to presentation strategy nor to retention period nor to the other interactions.

Table 3 about here

Figure 2 about here

Figure 3 about here

Table 4 about here

Discussion

The results of this study failed to support several important predictions. A significant difference in rates was found as predicted, i.e., the lower rates resulted in higher performances, but there was no significant difference between one-week and immediate retention scores. There was, however, significant interaction between rate and retention period which was not predicted. An inspection of these data indicate that performance at the lower rates dropped off when remeasured one week later, while performance at the higher rates tended to be higher than they had at the time of the immediate retention testing. This interaction is apparent in all three of the presentation strategies used in this study.

The major dimension if interest in this study, the presentation strategy, failed to demonstrate any significant differences. However, there is a trend

in the presentation strategy by retention period interaction which approached significance ($p<0.10$). The one-week retention data clearly show both double presentation strategies to be superior to the single presentation strategy; but in the immediate retention data, the double presentation levels of performance were, in a few cases, lower than the single presentation level of performance.

From an educational point of view, it is pertinent to evaluate the results of these data with respect to efficiency of learning at the various rates under the various presentation strategies. Such a comparison is made possibly by calculating learning efficiency indexes based upon the amount of learning per unit of learning time. The formula used in this study for calculating these indexes is as follows:

$$\text{Learning Efficiency Index} = \frac{\text{Treatment Mean} - \text{"Test Only" Mean}}{\text{Listening Time in Minutes}}$$

Table 5 presents learning efficiency indexes for immediate and one-week criterion data. The means for the "Test Only" group were obtained from a sample of 14 subjects who were administered only the test portion of the passages. The mean score of this group on the immediate retention criterion was 38.0, whereas 37.6 was the score on the one-week retention criterion. Figure 4 portrays the learning efficiency indexes for the one-week retention data. Inspection of the data in Figure 4 suggests that from the standpoint of learning efficiency there is little or nothing to be gained by double presentations of the material. In fact, the most efficient utilization of learning time, according to the data in this study, was listening once at 278 words per minute. The least efficient use of learning time

appears to be listening once at 378 words per minute, while the most favorable double presentation appeared to be listening twice at either 378 wpm or at 278 wpm.

Table 5 about here

Figure 4 about here

Summary

This study investigated learning through listening at rates ranging from 178 to 378 words per minute. Three presentation strategies--a single presentation, a double presentation, and a double presentation with a one-week interval between the presentations--were compared. Immediate and one-week retention data were gathered on each subject. Ninety-eight fifth grade children of average intelligence comprised the sample. Results of the study indicated relatively small differences among the rates or presentation strategies used in this study with respect to effectiveness and efficiency of learning. Thu this study would not support the hypothesis that pupils who listen twice at high rates of speed would be exposed to a more efficient learning situation than would students who listen to the same material once at a slower rate of speed. Of the treatment combinations used in this study, listening once at 278 words per minute resulted in the highest performance when evaluated with respect to learning efficiency.

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Table 1

Differences among the three presentation strategies.

Strategy	First Week	Second Week	Third Week
Single Presentation	Passage-Test A	Test B	
Double Presentation	Passage-Passage-Test A	Test B	
Split-Double Presentation	Passage	Passage-Test A	Test B

Table 2

Mean CA, MA, and IQ for Each of the 12 Treatment Groups

Rate in WPM	Single Presentation			Double Presentation			Split-Double Presentation		
	CA	MA	IQ	CA	MA	IQ	CA	MA	IQ
178	124	125	101	126	125	100	125	125	100
278	129	127	99	124	124	100	126	123	98
328	126	125	99	130	124	96	128	124	97
378	126	124	100	125	126	99	128	133	104

Table 3

Mean Immediate and One-Week Retention T-Scores
by Presentation Strategy and Rate

Rate in WPM	Single		Double		Split-Double	
	Immediate	One-Week	Immediate	One-Week	Immediate	One-Week
178	51.1	44.0	51.3	48.1	53.4	48.6
278	47.0	42.4	39.0	43.0	45.0	46.7
323	42.0	40.6	44.9	44.1	41.3	42.3
378	36.7	39.4	38.6	42.7	40.7	44.7

Table 4

Analysis of Variance:
Immediate and One-Week Retention T-Scores

Source	df	MS	F	p
Strategy (B)	2	83.055	1.281	0.284
Rate (C)	3	616.920	9.514	<0.001
BC	6	55.617		
Subjects/BC	72	64.841		
Retention (A)	1	5.360		
AB	2	54.445	2.341	0.104
AC	3	134.247	5.772	0.001
ABC	6	12.073		
A x Subjects/BC	72	23.258		
Total	167	55.588		

Table 5

Efficiency Indexes: Immediate and One-Week
Retention T-Scores by Presentation Strategy and Rate

Rate in WPM	Single			Double			Split-Double		
	Listening Time	Immediate	One-Week	Listening Time	Immediate	One-Week	Listening Time	Immediate	One-Week
178	15.0	.87	.43	30.0	.44	.35	30.0	.51	.37
278	9.6	.94	.53	19.2	.05	.28	19.2	.36	.47
328	8.1	.49	.37	16.2	.43	.40	16.2	.20	.29
378	7.1	-.18	.25	14.2	.04	.36	14.2	.19	.50

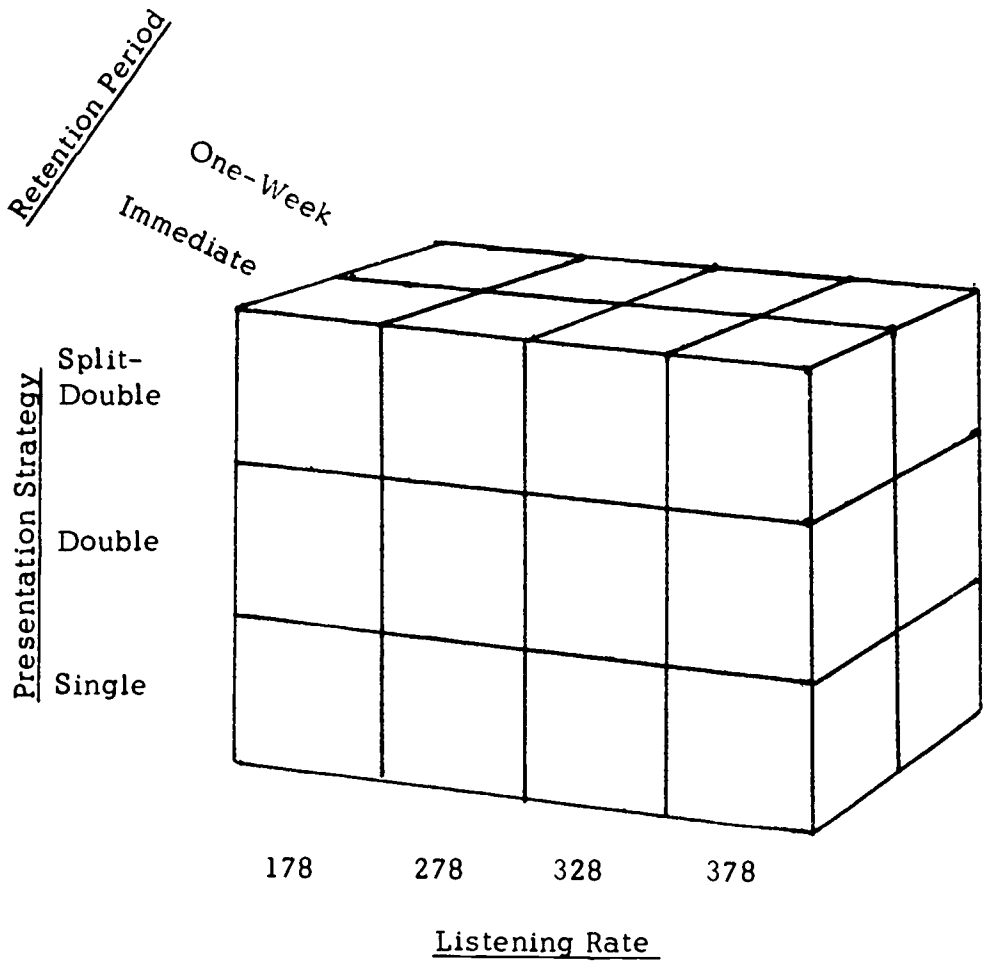

Figure 1. Design of the Study.

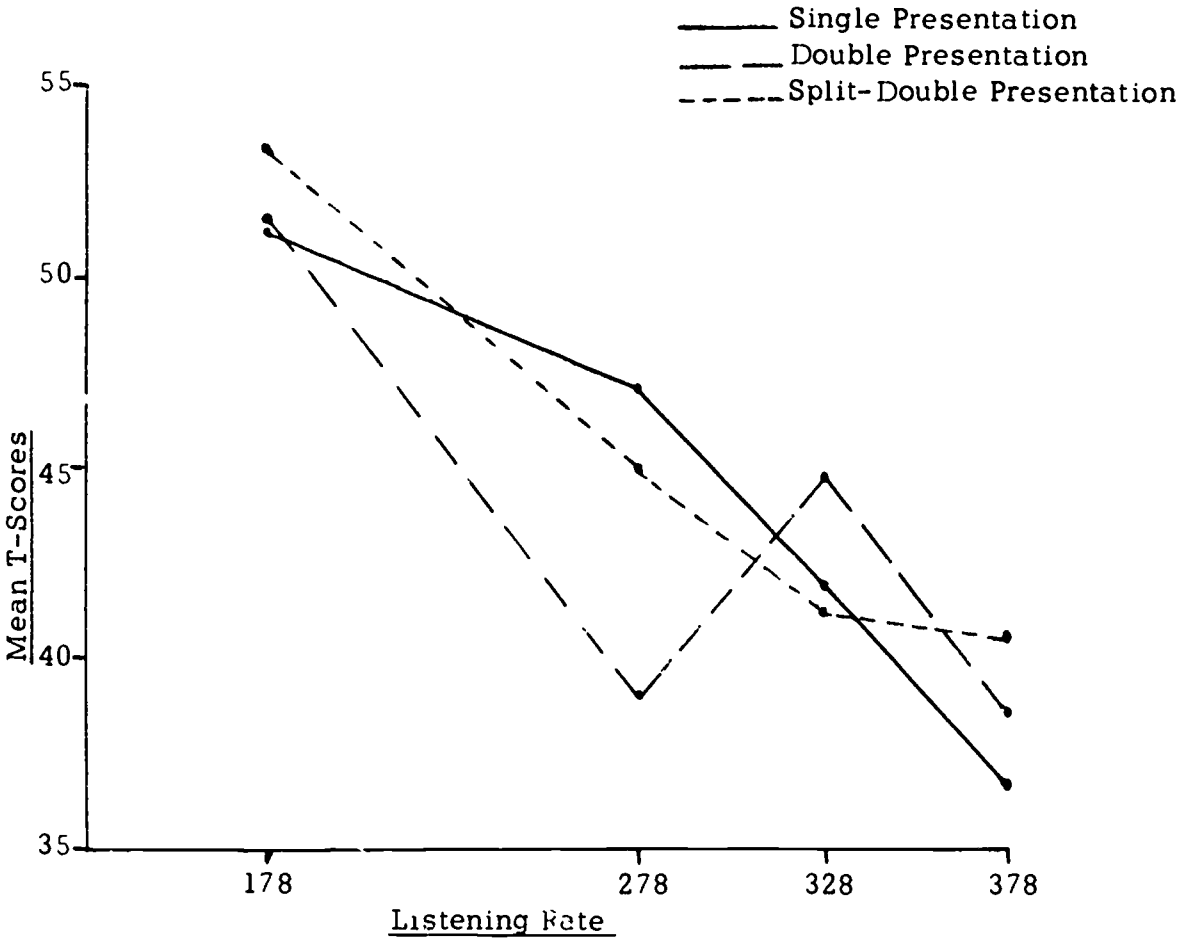

Figure 2. Immediate Retention T-Scores for the Three Presentation Strategies.

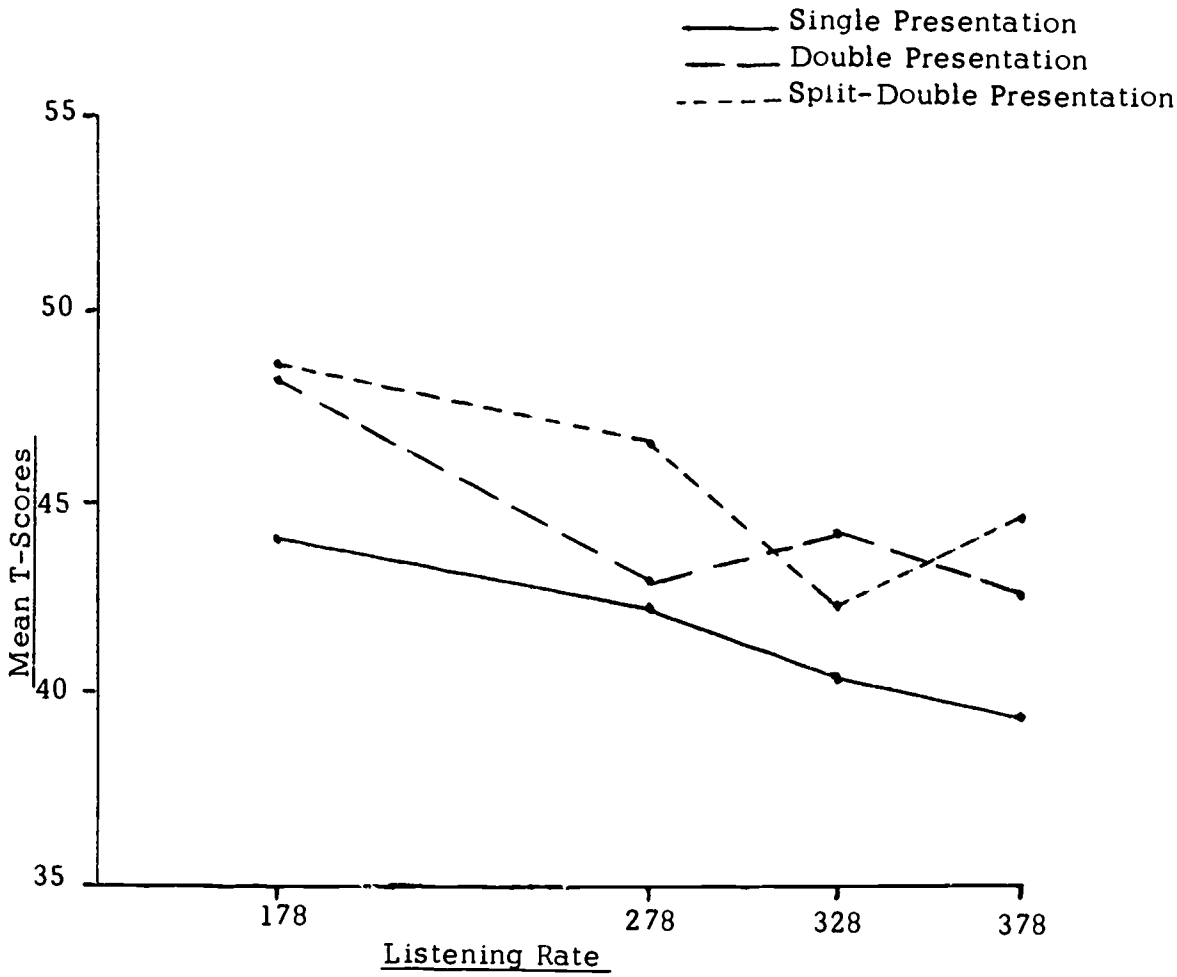

Figure 3. One-Week Retention T-Scores for the Three Presentation Strategies.

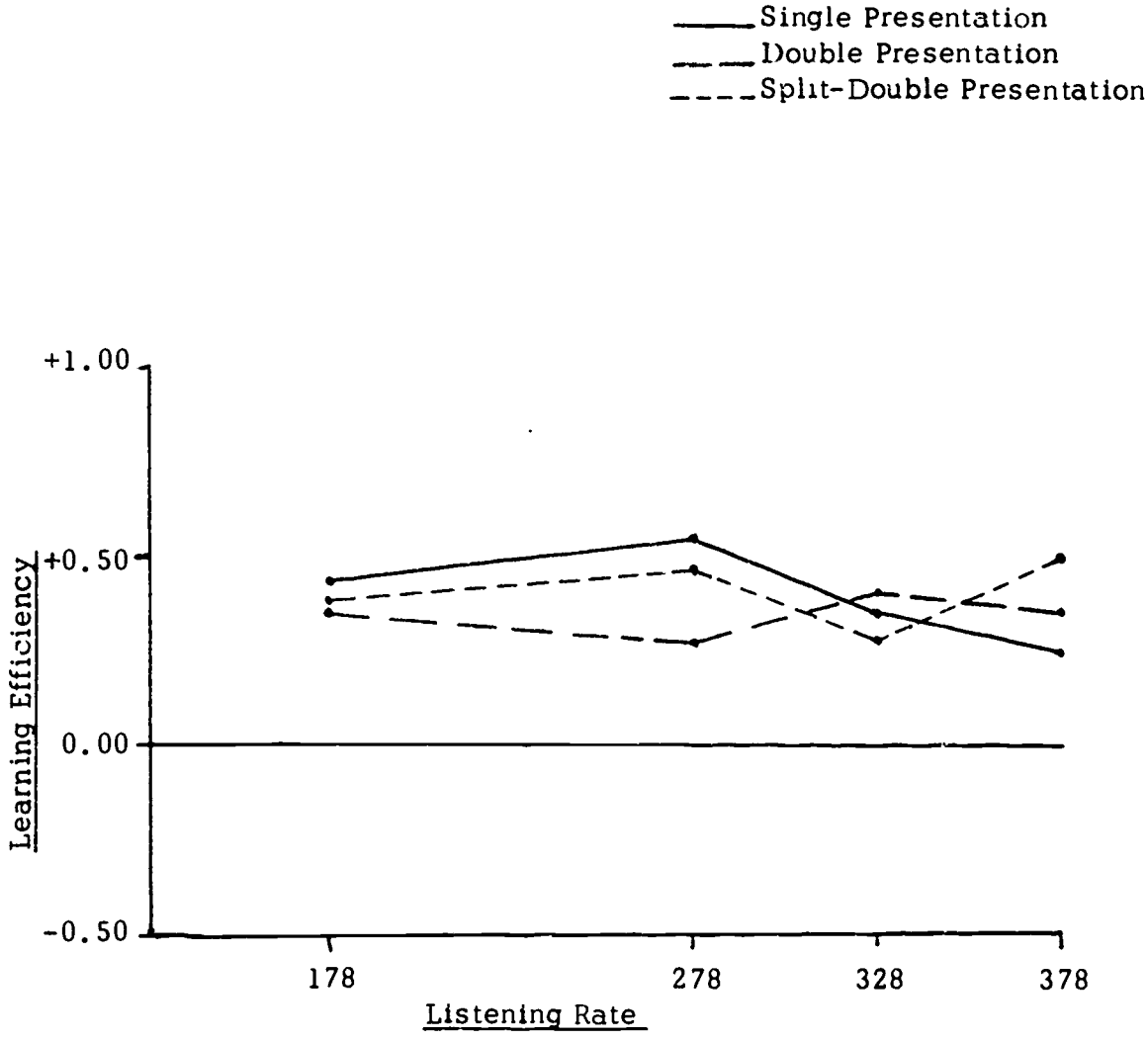

Figure 4. One-Week Retention Efficiency Indexes for the Three Presentation Strategies