

# Pausological Research in L2 Listening Comprehension: the Effects of Speech Speed and Pauses

Noriko Kano  
Makiko Saito

## 1. Introduction

Developing listening comprehension skills is one of the most difficult goals for Japanese students learning foreign languages. The faster the speech becomes, the more the listener needs to use recognition, memorization, and comprehension skills. As a result, pauses play an important role in helping the learners process input information. This study aims to examine the effects of speech speed and pauses and their interrelationships on word recognition and listening comprehension skills of Japanese students learning English as a foreign language.

Speech speed is one of the factors that influence the degree of comprehension; however, previous studies have yielded varied results. Flaherty (1979), Kelch (1985), and Griffiths (1990) found that slowing down the flow of speech speed aided language learners to understand the content, while Dwyer (1987) and Blau (1990, 1991) found that the reduced speech speed did not significantly help learners. One of the causes of conflicting results was the difference in the methods of measuring speech rate. For example, Blau (1990, 1991) altered the speech speed of the passage uniformly by using a sound pacer machine, whereas, in Griffiths' study (1990), speech speed was changed mainly by the length of pauses. That is, Griffiths examined the effects of pauses rather than those of speed.

Concerning the effects of pauses, Blau (1990, 1991) conducted two studies which showed opposite results. Her study in 1990 presented significant effects of pauses, while she found no effects of pauses in the study of 1991. In both studies, she inserted 3-second pauses at selected sentence, clause, and phrase boundaries, on average, every 23 words. The major difference between the two studies was the use of an achievement test. *The English as a Second Language Achievement Test (ESLAT)* scores were used as the covariate in the first study (1990); however, there was no scale to control listening proficiency levels of the subjects in the second study (1991).

In addition, comprehension and recognition are not identical. Even though learners recognize individual words, they do not always comprehend the passage. It is also possible that learners understand the listening passage with unrecognized words because the context of the passage and the learners' background knowledge compensate for the

unrecognizable words. Therefore, in this study, recognition of words and comprehension of the passage were measured separately in the independent scales.

As for the relationships between speech speed and pauses, according to Kohno (1981), whether listeners feel the listening passage is fast does not depend on speech speed, but on the length and frequency of pauses. Listening materials are comprehensible to learners when there are sufficient number and sufficient length of pauses. Suzuki (1994) showed the effectiveness of pauses artificially inserted between phrases or clauses. He found that phrase-pauses and clause-pauses aided listening comprehension more than did natural-pauses.

Based on the previous studies, the three following major hypotheses were addressed in studies I and II.

- 1) Speech speed affects word recognition, but not comprehension.
- 2) Pauses affect comprehension, but not recognition.
- 3) There is an interaction between speech rate and pauses; the effect of pauses is greater when the passage is delivered at a higher speed.

The significance of this study is that recognition and comprehension were measured independently, while controlling the subjects' general listening comprehension level as measured by *the JACET English Listening Comprehension Aptitude Test* (1996, Kaitakusha).

## 2. STUDY I

This study was conducted to investigate the effects of speech speed and pauses on word recognition and listening comprehension of Japanese junior college students. Specifically, the six research questions which were investigated in this study are:

Research question 1: Is there a significant difference between two conditions of speech speed (180 wpm & 140 wpm) in the word recognition test?

Research question 2: Are there significant differences between two conditions of pauses (natural-pause and with sentence-pause) in the word recognition test?

Research question 3: Is there significant interaction between speech speed and pauses in the word recognition test?

Research question 4: Is there a significant difference between two conditions of speech speed (180 wpm & 140 wpm) in the listening comprehension test?

Research question 5: Are there significant differences between two conditions of pauses (natural-pause and sentence-pause) in the listening comprehension test?

Research question 6: Is there significant interaction between speech speed and pauses in the listening comprehension test?

### 2.1 Methods

#### 2.1.1. Instruments

In order to control the general listening comprehension level of the subjects in this

study, the *JACET English Listening Comprehension Aptitude Test, Basic Form A* (1996, Kaitakusha) was used to measure the subjects' listening comprehension level. This test is designed to measure the listening comprehension of Japanese college students at the beginning level. The validity and reliability of the test has been checked based on data from 360,000 college students. The JACET scores of the subjects were used as a covariate in an ANOCOVA (analysis of covariance) test.

The listening test to measure the effects of speech speed and pauses on word recognition and comprehension of the students were made from a passage, "Studying at a U.S. university" in the magazine, *Mini World* (1995). This passage has 551 words, 35 sentences, and 10 paragraphs. The average number of words per sentence is 15.8. The readability of the passages is 9.3 on the Flesch-Kincaid Grade Level, and 10.2 on the Coleman-Liau Level. The topic of the passage is a life of a Japanese student studying at a university in the United States.

To examine the effects of speech speed, the listening tapes were recorded under two conditions, based on the speech rate categories proposed by Rivers (1981)--one at the normal speed (approximately 180 wpm) and one at the slow speed (approximately 140 wpm). The speech speed was slowed uniformly using *Sound Edit 2.0* on Macintosh. The original tape which has approximately a 1-second pause between sentences was used. Each tape has two different types -- natural-pause and sentence-pause (See table 1). The natural-pause tape has no insertion of extra pauses. The sentence-pause tape has an insertion of 2-second extra pauses between sentences. The average number of words between pauses is approximately 16 for the sentence-pause versions.

**Table 1** Four Versions of Listening Tapes

	Natural-Pause	Sentence-Pause
Average (180 wpm)	Version 1	Version 2
Slow (140 wpm)	Version 3	Version 4

Two types of questions were developed for each version of the tape--a word recognition test and a comprehension test. In the recognition test, 10 words were omitted, and the subjects were asked to fill in the blanks, listening to the tape. Approximately every 50th word of less than four syllables was omitted, so that the subjects' listening activity was less likely to be disturbed by writing. The subjects were required to fill in the 10 blanks with simple words, such as "exited", "made", "worse", and "remember". The comprehension test has 10 true-false questions about the content of the tape. A class was divided into two, and half of the students in a class took the recognition test and the remainder took the comprehension test while listening to the

same version of the tape.

#### 2.1.2. Subjects

The subjects participating in this study were female junior college students in the European and American Studies department. One hundred thirty-two first-year students who were taking Language Laboratory I participated in this study. A convenience cluster sampling method was used for selecting the sample. Four existing classes were randomly assigned to listen to one of the four versions of the monologue "Studying at a U.S. university".

#### 2.1.3. Procedure for Collection of Data

In the first session, the students took the *JACET Listening Comprehension Aptitude Test* to measure their general listening comprehension ability. In the second session, the four selected classes were randomly assigned to the four treatments: Version 1 (180 wpm, natural-pause); Version 2 (180 wpm, sentence-pause); Version 3 (140 wpm, natural-pause); and Version 4 (140 wpm, sentence-pause). All groups listened to the same passage one time in the language lab and answered either the word recognition questions or the comprehension questions. Two minutes were given to the students to look through the test sheets. The students who were assigned to the recognition tests were required to fill in the 10 blanks with simple words, while they were listening to the tape. They had 5 minutes after listening to check the spelling. The subjects who were assigned the comprehension test answered the 10 true-false questions. They could answer the questions both during and after listening. They were allowed to take notes while they were listening to the passages.

#### 2.1.4. Research Design

A two-way analysis of covariance (ANOCOVA,  $2 \times 2 =$  speech speed by pause) was employed to test for significant differences among group means on the word recognition test and the comprehension test. There were two dependent variables--the word recognition test scores and the comprehension test scores, while the two independent variables were speech speed and pause conditions. The *JACET Listening Comprehension Aptitude Test* was used as the covariate. ANOCOVA was chosen in order to control for varying levels of proficiency among subjects while testing for the effects of speed and pauses on word recognition and on listening comprehension. By using ANOCOVA to eliminate variation due to levels of proficiency, the effects of speed and pause can be seen more clearly.

#### 2.1.5. Procedure for Analysis of Data

When both instruments were scored, the data were entered into a computer. The Statistical Package for Social Science (SPSS) was used to test the two-way ANOCOVA .

### 2.1.6. Testing Research Questions

Data were analyzed with respect to each of the following research questions of this study:

Research question 1: The main effect of speech speed was checked using the ANOCOVA (*F*-test) to test for differences between two conditions of speech speed (180 wpm & 140 wpm) in the word recognition test.

Research question 2: The main effect of pauses was checked by using the ANOCOVA (*F*-test) to test for differences between two conditions of pause (natural-pause & sentence-pause) in the word recognition test.

Research question 3: The ANOCOVA was used to test for significant interaction between two factors--speech speed and pause in the word recognition test.

Research question 4: The main effect of speech speed was checked using the ANOCOVA (*F*-test) to test for differences between two conditions of speech speed (180 wpm & 140 wpm) in the listening comprehension test.

Research question 5: The main effect of pauses was checked by using the ANOCOVA (*F*-test) to test for differences between two conditions of pause (natural-pause & sentence-pause) in the listening comprehension test.

Research question 6: The ANOCOVA was used to test for significant interaction between two factors--speech speed and pause in the listening comprehension test.

## 2.2. Results

Results are reported separately for each dependent variable--the word recognition test scores (Research question 1 - 3), and the comprehension test scores (Research question 4 - 6).

### 2.2.1. Word Recognition

Mean scores on the 10 word recognition questions are reported in Table 2. Since the subjects assigned to the 180 wpm natural-pause version were originally in the high proficiency level measured by the *JACET test*, the observed score was higher than it really was; that is, if average students had been assigned to the 180 wpm natural-pause version, the mean score should have been lower. However, as a general tendency, it is observed that the subjects who listened to the slower versions of the listening tape scored higher and that the subjects in the sentence-pause groups scored higher. Table 3 presents the overall tests for significance on the word recognition in answer to the research questions on speed and pause. The overall regression was significant at the  $p < .01$  level ( $F=9.50$ , 1 df,  $p < .003$ ).

**Table 2** Group Means on Word Recognition

	Natural-Pause	Sentence-Pause
180 wpm (JACET score)	3.29 (22.35)	2.94 (12.55)
140 wpm (JACET score)	3.19 ( 3.63)	4.47 ( 8.13)

**Table 3** Overall Tests for Significance on Word Recognition Scores--Speed by Pause ANOCOVA

Effect	DF	SS	MS	F	P
Regression	1	28.26	28.26	9.50	.003
Speed	1	16.01	16.01	5.38	.024
Pause	1	5.32	5.32	1.79	.186
Speed by Pause	1	5.32	5.32	1.79	.186
Total	61	230.36	4.32		

The results are reported with respect to each of the research questions of this study:

Research question 1: There was a significant effect of speech speed ( $F=5.38$ , 1 df,  $p<.024$ ) on the word recognition scores. The subjects who listened to the 140 wpm tapes recognized more words than did the subjects in the 180 wpm groups.

Research question 2: No significant effect of pauses was found ( $F=1.79$ , 1 df,  $p<.186$ ) in the number of words the subjects recognized. Although the subjects in the sentence-pause group seemed to score higher than the natural-pause groups, the difference was not statistically significant.

Research question 3: The result of ANOCOVA indicated no significant interaction between speech speed and pauses ( $F=1.79$ , 1 df,  $p<.189$ ) on word recognition. When the subjects' proficiency level (JACET score) was controlled -- the effects of the JACET test score eliminated -- the 140 wpm group scored higher in both pause conditions, and the sentence-pause groups scored higher than the natural-pause group in each speed version.

### 2.2.2. Comprehension

Mean scores on the 10 true-false comprehension questions are reported in Table 4. The subjects in the 180 wpm natural-pause version scored slightly higher in the comprehension test than did the subjects in other groups because of their high general listening ability measured by the *JACET test*. No significant difference is observed among the four groups in the comprehension scores presented in Table 4. Table 5 presents overall test results for significance on comprehension in answer to the research questions 4 to 6.

**Table 4** Group Means of Comprehensino Score

	Natural-Pause	Sentence-Pause
180 wpm (JACET score)	7.12 (19.22)	6.53 (4.71)
140 wpm (JACET score)	6.69 ( 14.75)	6.87 ( 8.67)

**Table 5** Overall Tests for Significance on Word Recognition Scores--Speed by Pause ANOCOVA

Effect	DF	SS	MS	F	P
Regression	1	24.33	24.33	13.07	.001
Speed	1	0.06	0.06	0.17	.686
Pause	1	0.31	0.31	0.03	.855
Speed by Pause	1	1.06	1.06	0.57	.454
Total	65	141.82	2.18		

Research question 4: No significant effect of speech speed ( $F=0.03$ , 1 df,  $p<.855$ ) was found in the comprehension scores. The subjects who listened to the 180 wpm tapes scored as high as did the subjects who listened to the 140 wpm tapes in the comprehension test.

Research question 5: In answer to research question 5, the main effect of pause was not significant ( $F=0.17$ , 1 df,  $p<.686$ ) between the two conditions.

Research question 6: With respect to research question 6, the result of ANOCOVA showed significant interaction between speech speed and pause ( $F=0.57$ , 1 df,  $p<.454$ ) in the comprehension questions.

### 3. STUDY II

In Study I, it was found that speech speed influenced recognition of words; however significant effects of speed were not found on the comprehension scores. However, according to the questionnaire attached at the end of the test, 85.7% of the students who listened to the 180 wpm tape reported that the speech speed was either very fast or fast. Forty-one point nine percent of the subjects in the 140 wpm groups also perceived that the speech speed of the tape was either very fast or fast. Therefore, the speech speed used in Study I might not be appropriate for the subjects in this study. In Study II, speech speed was reduced by 10 wpm for each pause condition.

Concerning the effects of pause, no significant effect was observed Study I. One of the reasons considered is that since true-false questions were used, a high possibility

exists that the subjects answered correctly by coincidence. Therefore, in Study II, comprehension questions were changed to a multiple-choice format to reduce the possibility that the subjects answer correctly by coincidence.

In addition, Kohno (1994) argued that pauses between phrases were effective for EFL learners to comprehend the listening material. We added one more pause condition, phrase-pause, to natural- and sentence-pause conditions in order to examine the effect of pauses.

Concerning the content of the listening passage, 57.6% of the subjects reported in the questionnaire that the content was either very difficult or difficult to understand. Therefore, an easy and familiar topic with which Japanese students experience in their daily life was chosen in Study II.

Based on the re-consideration of Study I, Study II was conducted to answer the following six questions.

Research question 1: Is there a significant difference between two conditions of speech speed (170 wpm & 130 wpm) in the word recognition test?

Research question 2: Are there significant differences among three conditions of pauses (natural-pause, sentence-pause, & phrase-pause) in the word recognition test?

Research question 3: Is there significant interaction between speech speed and pauses in the word recognition test?

Research question 4: Is there a significant difference between two conditions of speech speed (170 wpm & 130 wpm) in the listening comprehension test?

Research question 5: Are there significant differences among three conditions of pauses (natural-pause, sentence-pause, & phrase-pause) in the listening comprehension test?

Research question 6: Is there significant interaction between speech speed and pauses in the listening comprehension test?

### 3.1 Methods

#### 3.1.1. Instruments

The *JACET English Listening Comprehension Aptitude Test, Basic Form A* (1996, Kaitakusha) was utilized to control the subjects' general listening comprehension level. The JACET scores of the subjects were used as covariate in an ANOCOVA test.

The listening test to measure the effects of speech speed and pauses on word recognition and comprehension of the students was developed from a passage, "Should you have a pet?" written by Daniel Kahl in the magazine, *Mini World* (1996). This passage has 519 words, 34 sentences, and 10 paragraphs. The average number of words per sentence is 15.3. The readability of the passage is 5.7 on the Flesch-Kincaid Grade Level, and 5.4 on the Coleman-Liau Level. In order to minimize the effects of the subjects' background knowledge, a general topic that the students face in their daily life--the problems of having pets in Japan--was chosen.

To examine the effects of speech speed, the listening tapes were recorded under two conditions--one at the normal speed (approximately 170 wpm) and one at the slow speed (approximately 130 wpm). The speech speed was slowed uniformly using *Sound Edit 2.0*. The original tape which has approximately a 1-second pause between sentences was used. Each tape has three different types, natural-pause, sentence-pause, and phrase-pause (See table 6). The natural-pause tape has no insertion of extra pauses. The sentence-pause tape has an insertion of 2-second extra pauses between the sentences, and the phrase-pause tape has 2-second pauses between phrases. The average number of words between pauses is approximately 15 for the sentence-pause versions, and approximately 8 words for the phrase-pause versions.

**Table 6** Six Versions of Listening Tapes

	Natural-Pause	Sentence-Pause	Phrase-Pause
Normal (170 wpm)	Version 1	Version 2	Version 3
Slow (130 wpm)	Version 4	Version 5	Version 6

A word recognition test and a comprehension test were made for each version of the tape. The recognition test was developed in the same procedure as in Study I; that is, approximately every 50th word of less than four syllables was omitted. The comprehension test has 10 multiple-choice questions about the content of the passage. Seven out of the ten questions are about the details of the content which cover only one paragraph, and the other three questions cover several paragraphs. A class was divided into two, and a half of the students in a class took the recognition test and the remainder took the comprehension test.

### 3.1.2. Subjects

The subjects participating in this study were female junior college students in the European and American Studies department. One hundred fifty-nine first-year students who were taking the Language Laboratory I participated in this study. Forty-three second-year students who were taking Language Laboratory II also participated in the study. Six existing classes were randomly assigned to listen to one of the six versions of the monologue "Should you have a pet?"

### 3.1.3. Procedure for Collection of Data

In the first session, the students took the *JACET Listening Comprehension Aptitude Test*. In the following session, the six selected classes were randomly assigned to the six

treatments: Version 1 (170 wpm, natural-pause), Version 2 (170 wpm, sentence-pause), Version 3 (170 wpm, phrase-pause), Version 4 (130 wpm, natural-pause), Version 5 (130 wpm, sentence-pause), and Version 6 (130 wpm, phrase-pause). All groups heard the same passage one time and answered either the word recognition questions or the comprehension questions.

#### 3.1.4. Research Design

A two-way analysis of covariance (ANOCOVA, 2 x 3 = speech speed by pause) was used to test for significant differences among group means on the word recognition test and the comprehension test. The *JACET Listening Comprehension Aptitude Test* was used as the covariate.

#### 3.1.5. Procedure for Analysis of Data

When both instruments were scored, the data were entered into a computer. The Statistical Package for Social Science (SPSS) was used to test the two-way ANOCOVA .

#### 3.1.6. Testing Research Questions

Data were analyzed with respect to each of the following research questions of this study:

Research question 1: The main effect of speech speed was checked using the ANOCOVA (*F*-test) to test for difference between two conditions of speech speed (170 wpm & 130 wpm) in the word recognition test.

Research question 2: The main effect of pauses was checked using the ANOCOVA (*F*-test) to test for differences among three conditions of pauses (natural-pause, sentence-pause, & phrase-pause) in the word recognition test.

Research question 3: The ANOCOVA was used to test for significant interaction between two factors--speech speed and pauses in the word recognition test.

Research question 4: The main effect of speech speed was checked by using the ANOCOVA (*F*-test) to test for differences between two conditions of speech speed (170 wpm & 130 wpm) in the listening comprehension test.

Research question 5: The main effect of pauses was checked using the ANOCOVA (*F*-test) to test for differences among three conditions of pauses (natural-pause, sentence-pause, & phrase-pause) in the listening comprehension test.

Research question 6: The ANOCOVA was used to test for significant interaction between two factors--speech speed and pauses in the listening comprehension test.

### 3.2. Results

Results are reported separately for each dependent variable--the word recognition test scores (Research question 1 - 3), and the comprehension test scores (Research question 4 - 6).

### 3.2.1. Word Recognition

Mean scores on the 10 word recognition questions are reported in Table 7. It is observed that the subjects who listened to the slow versions of the listening tape scored higher and that the subjects in the phrase-pause groups scored higher.

Table 8 reports overall test result for significance on word recognition, answering the research questions on speed and pauses. The overall regression was significant at the  $p < .05$  level ( $F=5.54$ , 1 df,  $p < .021$ ).

**Table 7** Group Means on Word Recognition

	Natural-Pause	Sentence-Pause	Phrase-Pause
170 wpm (JACET score)	4.93 (4.29)	4.94 (1.25)	6.00 (20.52)
130 wpm (JACET score)	5.87 (2.67)	6.06 (14.00)	6.41 (8.24)

**Table 8** Overall Tests for Significance on Word Recognition Scores--Speed by Pause ANOCOVA

Effect	DF	SS	MS	F	P
Regression	1	11.49	11.49	5.54	.021
Speed	1	17.15	17.15	8.26	.005
Pause	2	8.52	4.26	2.05	.134
Speed by Pause	2	.59	.30	.14	.868
Total	101	239.37	2.37		

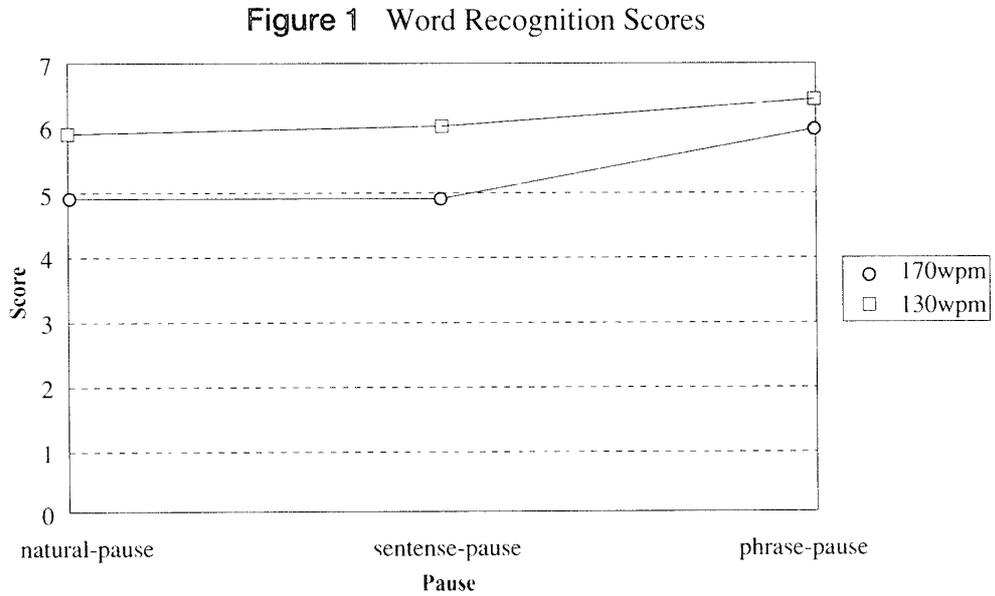
The results are reported with respect to each of the research questions of this study:

Research question 1: With respect to research question 1, there was a significant effect of speech speed ( $F=8.26$ , 1 df,  $p < .005$ ) on the word recognition scores. The subjects who listened to the 130 wpm tapes recognized more words than did the subjects in the 170 wpm groups.

Research question 2: No significant effect of the pauses was found ( $F=2.05$ , 2 df,  $p < .134$ ) in the number of words the subjects recognized. The subjects in the phrase-pause groups scored higher than the sentence-pause and natural-pause groups, though the difference was not statistically significant.

Research question 3: The result of ANOCOVA indicated no significant interaction between speech speed and pauses ( $F=.14$ , 2 df,  $p < .868$ ) on word recognition. As shown in Figure 1, the 130 wpm group scored higher in every pause condition, and the phrase-

pause group scored the highest, followed by the sentence-pause group, and the natural-pause group in each speed version.



3.2.2. Comprehension

Mean scores on the 10 multiple-choice comprehension questions are reported in Table 9. Table 10 presents overall test results for significance on comprehension in answer to research questions 4 to 6.

**Table 9** Group Means of Comprehension Score

	Natural-Pause	Sentence-Pause	Phrase-Pause
170 wpm (JACET score)	5.00 (29.50)	4.53 (4.71)	6.00 (21.29)
130 wpm (JACET score)	5.64 (0.86)	6.12 (9.53)	5.75 (3.25)

Research question 4: There was a significant effect of speech speed ( $F=10.25$ , 1 df,  $p<.002$ ) on the comprehension scores.

**Table 10** Overall Tests for Significance on Comprehension Scores--Speed by Pause ANOCOVA

Effect	DF	SS	MS	F	P
Regression	1	3.40	3.40	1.94	.066
Speed	1	17.96	17.96	10.25	.002
Pause	2	8.05	4.03	2.30	.106
Speed by Pause	2	13.72	6.86	3.92	.023
Total	99	206.91	2.09		

The subjects who listened to the 130 wpm tapes scored higher than the subjects who listened to the 170 wpm tapes.

Research question 5: In answer to research question 5, the main effect of the pauses was not significant ( $F=2.05$ , 2 df,  $p<.134$ ) among the three conditions. However, when the phrase-pause groups and the natural-pause groups were compared, the difference between the two was significant at the  $p<.05$  level ( $F=4.11$ , 1 df,  $p<.047$ ). The subjects in the phrase-pause groups scored significantly higher than the subjects in the natural-pause groups.

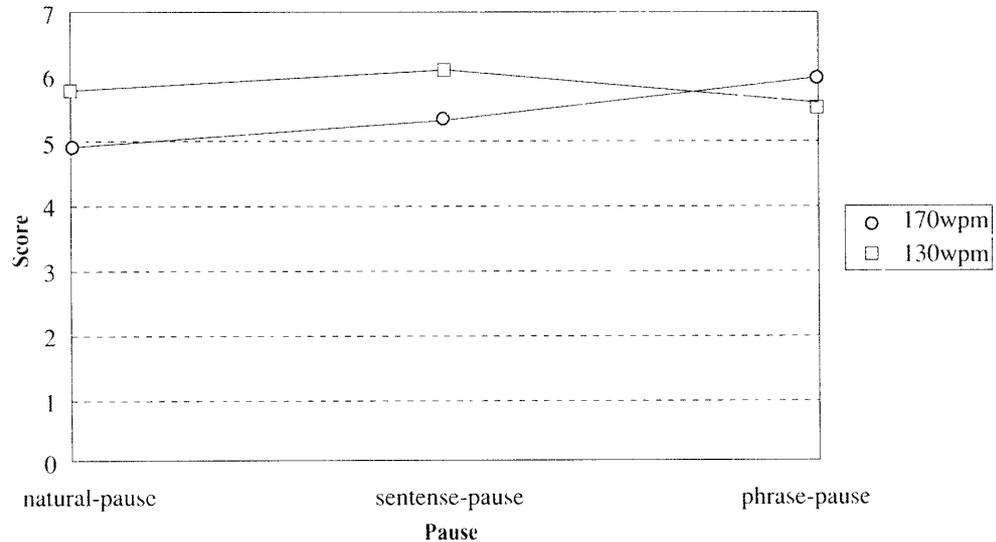
Research question 6: With respect to research question 6, the result of ANOCOVA showed significant interaction between speech speed and pauses ( $F=3.92$ , 2 df,  $p<.023$ ) on comprehension. As shown in Figure 2, the subjects who listened to the 130 wpm tapes scored higher in the natural-pause and sentence-pause conditions; however, the 170 wpm group performed better than 130 wpm group in the phrase-pause condition. Post-hoc tests showed significant interaction between the phrase-pause groups and the sentence-pause groups ( $F=9.096$ , 1 df,  $p<.004$ ), and between the phrase-pause groups and the pause groups ( $F=4.833$ , 1 df,  $p<.032$ ). Listening comprehension was disturbed by the frequent pauses when the passage was delivered at a low speed. The result suggests the possibility that incoming information at an extremely slow pace sometimes exceeds the subjects' memory span.

#### 4. DISCUSSION

It was found in Study I and II that speech speed was the influential factor for word recognition. The subjects could recognize more words when the passage was delivered at a lower speed. Concerning the effects of pauses, the results of the two studies were rather complicated. In Study I, no significant effects of pauses were found on the word recognition, while significant effects of pauses was observed in study II. Since the mean score of the phrase-pause group was high, it is considered that the subjects could spend the pause time guessing the meaning of unrecognized words and phrases from the context. No interactions between speed and pause were found in both Study I and II.

Concerning the comprehension test, the results of the two studies were not clear-cut.

Figure 2 Comprehension Scores



No significant effects of speed on comprehension were found in Study I, while there were significant effects of speed in Study II. Ogasawara (1980) reported that 130 wpm was the boundary speed for Japanese students which divide comprehensible and not comprehensible; that is, listening comprehension of Japanese students drastically drops when a listening passage is delivered faster than 130 wpm. In Study I, the difference between the two versions of speed was not found because both versions were delivered faster than 130 wpm. In Study II, one of the speed conditions was faster than 130 wpm, while another was at the speed of 130, which resulted in the conflicting results between Study I and II.

The effects of pauses on the comprehension scores were also complicated. In Study I, a significant effect of pauses was not found, due to the inadequate format of the comprehension questions. Since each question was true-false type, a high possibility existed that the subjects answered correctly by coincidence. However, the result of *the quantification equation class 1* (Hayshi and Akudo, 1976) showed that the effect of the pauses was stronger than that of speech speed in listening comprehension. In Study II, overall effect of pauses was not statistically significant; however, the difference between the natural-pause groups and the phrase-pause groups was significant. The subjects who listened to the phrase-pause passage scored significantly higher than the subjects in the natural-pause groups. Since the difference between the phrase-pause groups and the sentence-pause groups was not significant, the frequent use of pause is necessary for the students to facilitate their listening comprehension.

No interrelationships between speech speed and pause on comprehension were found in Study I, due to the inadequate test format; however, the results of Study II showed significant interaction between speech speed and pauses. When speech speed was slow,

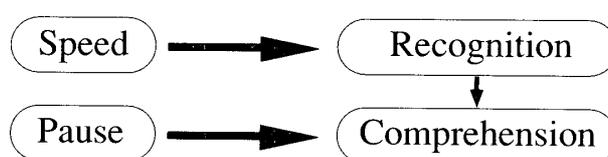
there was not a significant effect of pause, whereas, when speech speed was high, pauses facilitated listening comprehension. When the speech speed is slow enough for the subjects, they do not pay attention to the pause; however, when the information is delivered at a high speed, it is thought that the subjects utilize the pauses as the time to process and memorize the incoming information. In addition, the passage with frequent pauses at slow speed may exceed the subjects' working memory capacity; therefore, it is considered the subjects who listened to the phrase-pause version at a speed of 130 wpm scored lower than the subjects in the sentence-pause and the natural-pause groups. On the other hand, when the speech speed is extremely high, the subjects will have trouble recognizing each word, phrase, and clause, which will indirectly hinder comprehension.

Even though the overall effects of pauses on comprehension were not statistically significant, the mean score of the phrase-pause groups was significantly higher than that of the natural-pause groups. The mean scores between the sentence-pause group and the natural-pause group did not show a significant difference. These results indicate that the phrase-pause is the most effective for comprehension. This might be a result of frequency of pauses. In addition, it is possible that it might be easier for learners to memorize and understand input information when pauses occur between clusters (chunks) which convey a unit of meanings. The sentence-pause did not show any effects on the comprehension test possibly because the pause did not occur frequent enough, so that the amount of information to remember within a certain period of time might be too large.

In our daily life, pauses are not inserted as frequently in faster speech as in the phrase-pause condition in Study II. Therefore, the listening tape of 170 wpm with 2-second phrase-pauses was neither realistic nor natural, which might have caused confusion of the subjects. Kanzaki et al. (1995) statistically showed that when the speech speed (such as the reading) was fasten, not only various changes in sound occurred but also the length of pauses was shortened and the frequency of pauses was reduced.

In summary, the results of the two studies show the tendency that speech speed affects word recognition, which indirectly influences comprehension, and that pauses affect comprehension when the passage is delivered at a higher speed. (See Figure 3). In addition, frequent insertions of pauses (phrase-pause) aid learners to comprehend the listening materials especially when the passage is presented at a normal speed.

Figure 3



## 5. Future studies

The listening material in this study was a monologue read by one person. In real settings, however, this type of listening activity is rather rare (except for lectures, TV and radio news). We usually face conversations spoken by more than two persons. It would be interesting to examine how the relationships between speech speed and pause conditions differ in a conversational listening material.

It is also necessary to consider the quality of pause carefully. In Study I and II, the pauses artificially inserted were silent gaps without noise. In natural speech, however, pauses are usually filled with hesitation markers such as 'uh' and 'well'. These filled pauses hardly disturb comprehension (Kohno, 1994), rather they facilitate listening comprehension (Blau, 1991). Therefore, the effects of hesitation markers should be taken into consideration in the further research. Considering the delimitation of this study, further studies will be needed with improved research designs.

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