

NPRDC TR 85-9

NOVEMBER 1984

**READING AND LISTENING PROCESSES IN
BILINGUALS**

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San Diego, California 92152**



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SECURITY CLASSIFICATION OF THIS PAGE

REPORT DOCUMENTATION PAGE					
1a REPORT SECURITY CLASSIFICATION UNCLASSIFIED		1b RESTRICTIVE MARKINGS	2a SECURITY CLASSIFICATION AUTHORITY		2b DECLASSIFICATION/DOWNGRADING SCHEDULE
3 DISTRIBUTION/AVAILABILITY OF REPORT Approved for public release; distribution unlimited.				4 PERFORMING ORGANIZATION REPORT NUMBER(S)	
				5 MONITORING ORGANIZATION REPORT NUMBER(S) NPRDC TR 85-	
6a NAME OF PERFORMING ORGANIZATION Navy Personnel Research and Development Center				6b OFFICE SYMBOL (if applicable) Code 51	
6c ADDRESS (City, State and ZIP Code) San Diego, CA 92152-6800			7a NAME OF MONITORING ORGANIZATION		7b ADDRESS (City, State and ZIP Code)
8a NAME OF FUNDING/SPONSORING ORGANIZATION Office of Naval Research			8b OFFICE SYMBOL (if applicable) ONR-270	8c ADDRESS (City, State and ZIP Code) Arlington, VA 22217	
9 PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER		10 SOURCE OF FUNDING NUMBERS		PROJECT NO	TASK NO
		PROGRAM ELEMENT NO 62763N	RF63-522-801	-011	WORK UNIT NO -03.05
11 TITLE (Include Security Classification) READING AND LISTENING PROCESSES IN BILINGUALS					
12 PERSONAL AUTHOR(S) Chang, Frederick R.					
13a TYPE OF REPORT Technical Report		13b TIME COVERED FROM <u>May 83</u> TO <u>May 84</u>	14 DATE OF REPORT (Year, Month, Day) November 1984		15 PAGE COUNT 20
16 SUPPLEMENTARY NOTATION					
17 COSAT CODES			18 SUBJECT TERMS (Continue on reverse if necessary and identify by block number)		
FIELD	GROUP	SUB-GROUP	English as a second language (ESL), native English-speaking (NES), the literary assessment battery (LAB)		
05	09				
19 ABSTRACT (Continue on reverse if necessary and identify by block number)					
<p>In the next 10 to 15 years, the Navy will face decreases in its pool of native English-speaking (NES) recruits. As a result, the Navy may need to accept recruits from bilingual populations who speak English as a second language (ESL). In the past, the Navy has found that ESL personnel tend to have higher attrition rates, reduced promotional potential, and reduced Navy effectiveness compared to NES recruits from the higher mental categories. The Navy must make effective use of the bilingual personnel.</p> <p>The objectives of this research were to investigate some of the difficulties ESL students have in the comprehension of spoken and written passages and to clarify the role of vocabulary knowledge and decoding abilities of ESL students.</p> <p>Paragraph comprehension, vocabulary, and decoding tasks were administered to two groups of subjects. The tasks were given to 47 NES subjects and 28 ESL subjects. All subjects had scored below the 7.5 reading grade level on the Gates-MacGinitie reading test.</p>					
20 DISTRIBUTION/AVAILABILITY OF ABSTRACT <input checked="" type="checkbox"/> UNCLASSIFIED/UNLIMITED <input type="checkbox"/> SAME AS RPT <input type="checkbox"/> DTIC USERS			21 ABSTRACT SECURITY CLASSIFICATION UNCLASSIFIED		
22a NAME OF RESPONSIBLE INDIVIDUAL Chang, F.			22b TELEPHONE (Include Area Code) (619) 225-6434		22c OFFICE SYMBOL Code 51

DD FORM 1473, 84 JAN

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READING AND LISTENING PROCESSES IN BILINGUALS

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The results were that comprehension and vocabulary performance of ESL subjects was worse than that of the NES subjects but that the two groups were virtually identical in decoding performance.

The main conclusions from this study are (1) the ESL and the marginally literate NES groups showed different patterns of performance on the tasks, (2) vocabulary performance of the ESL students was worse than that of the NES students, but vocabulary knowledge alone could not account for the comprehension difference found between the groups, and (3) the two groups were nearly identical in decoding performance. Thus the comprehension difference between the groups could not be explained by a decoding deficit in the ESL students.

FOREWORD

This research was conducted within task area RF63-522-801-011 (Enhancing Basic Skills), work unit 03.05 (utilization of bilingual Navy personnel). The objective of this work unit was to understand and improve the communicative competence of bilingual Navy personnel who speak English as a second language.

Appreciation is extended to Master Chief David Richie and to the staff of the Academic Remedial Training Center, San Diego, for their support and cooperation in the successful completion of this research.

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SUMMARY

Problem

In the next 10 to 15 years, the Navy will face a decreasing pool of native English-speaking (NES) recruits. As a result, the Navy may need to accept recruits from bilingual populations who speak English as a second language (ESL). In the past, ESL personnel have had higher attrition rates, reduced promotional potential, and reduced Navy effectiveness compared to NES recruits from the higher mental categories.

Objectives

The objectives of this research were to (1) identify difficulties ESL students have comprehending spoken and written passages, and (2) clarify the role of vocabulary knowledge and decoding abilities of ESL students.

Method

Paragraph comprehension, vocabulary, and decoding tasks were administered to two groups of subjects: 47 NES and 28 ESL. All subjects had scored below the 7.5 grade level on the Gates-MacGinitie reading test.

Results

Comprehension and vocabulary performance of ESL subjects was worse than that of the NES subjects, but the two groups were virtually identical in decoding performance.

Conclusions

1. The ESL and the marginally literate NES groups showed different patterns of performance on the tasks.
2. Vocabulary performance of the ESL students was worse than that of the NES students, but vocabulary knowledge alone apparently could not account for the comprehension difference found between the groups.
3. The two groups were nearly identical in decoding performance. Thus, the comprehension difference between the groups could not be explained by a decoding deficit in the ESL students.

Recommendations

Research must be done in several areas before the Navy can expect to make significant improvements in training bilingual recruits:

1. Further experimental studies should specify in detail the conditions under which comprehension breaks down.
2. Language ability in the bilingual's native language should be assessed.
3. Field studies should investigate language use in various actual Navy environments.

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INTRODUCTION

Problem

Demographic studies indicate that in the next 10 to 15 years the Navy will face a decreasing pool of native English-speaking (NES) 18- to 21-year-old males in the higher mental categories of the Armed Forces Qualification Test (AFQT) composite. In order to meet manpower needs, the Navy may need to accept more recruits from other groups; that is, from the lower mental categories or from the bilingual population who speak English as a second language (ESL). Marginally literate NES personnel tend to have higher attrition rates and are less effective than other Navy recruits (Fletcher, Duffy, & Curran, 1977). Similarly, ESL personnel advance more slowly than NES personnel and are less effective in the Navy (Salas, Kincaid, & Ashcroft, 1980).

Background

This report presents preliminary results on the listening and reading abilities of bilingual and marginally literate NES personnel. The research presented here is part of a larger research project designed to understand and improve the communicative competence of bilingual personnel.

Academic Remedial Training (ART)

The Navy currently enlists a small number of marginally qualified personnel. These recruits receive training in basic skills, mainly reading, in the ART program at the three Navy Recruit Training Commands (RTCs) located in San Diego, California; Orlando, Florida; and Great Lakes, Illinois. In general, there are three ways by which recruits are assigned to the ART program. During the first week of recruit training, all recruits are given the Gates-MacGinitie Reading Test (Gates & McGinitie, 1978). Recruits who score above 6.0 in reading grade level (RGL) are processed directly through regular recruit training. Recruits scoring below 6.0 RGL are retested the next day on another form of the Gates-MacGinitie test for confirmation of the reading weakness. Recruits scoring below 4.0 are referred to a review board and may be enrolled in ART. Recruits scoring between 4.0 and 6.0 are directly enrolled in ART. Recruits who score above 6.0 may also be referred to ART if they fail one or more of the recruit training tests. At the San Diego RTC, the 6.0 RGL cutoff has recently been raised to 7.5.

Approximately 5 percent of all recruits are processed through ART and about 20 percent of these are ESL personnel. In San Diego, approximately 80 percent of the ESL recruits are Filipinos. A total of about 3000 recruits are processed through the three ART programs a year, with about equal numbers of recruits in each program.

Once in ART, students are given the Stanford Diagnostic Reading Test (SDRT) (Karlsen, Madden, & Gardner, 1976) that diagnoses weaknesses in decoding (phonetic and structural analysis), auditory vocabulary, literal and inferential comprehension, and reading rate. The NES students are sent to a special class to work on the problems diagnosed by the SDRT. Students spend from 1 to 3 weeks completing study modules. The ESL students are sent to a different class to work for 3 weeks on their reading skills with particular emphasis on oral instruction. After these classes, all students complete a study skills module designed to prepare students for the academic curriculum they will receive in recruit training. The study skills module emphasizes skills for effective studying and performance on tests.

Individual Differences in Reading

An active area of research is the study of individual differences in reading. The aim of the research is to discover the underlying skills and knowledge that differentiate good from poor readers. A typical research strategy is to identify readers along a reading dimension, as assessed by a reading test. Good and poor readers are selected on the basis of the reading assessment and are given a variety of cognitive performance tasks. Performance of the two groups on the tasks is compared, and inferences are made about the processes underlying skilled reading ability (e.g., Frederiksen, 1980; Graesser, Hoffman, & Clark, 1980; Jackson & McClelland, 1975, 1979). This sort of analytic approach has the potential for uncovering the sources of differences in reading ability not only between the literate and marginally literate personnel but also between the marginally literate NES recruits and the marginally literate bilingual ESL population.

Objectives

The objectives of this research were to (1) identify difficulties ESL students have comprehending spoken and written passages, and (2) clarify the role of vocabulary knowledge and decoding abilities of ESL students.

METHOD

Two groups of subjects--one ESL and one marginally literate NES--were given a variety of tasks to perform. These tasks were designed to shed light on different components of the comprehension process. Subjects were required to comprehend passages that were either read to them or that they read themselves. By presenting the passages through listening and reading, it was possible to compare comprehension in a situation where there was a written decoding component with comprehension in a situation where there was not one (presumably, though, there was a "listening decoding" component in the listening comprehension task). That is, if listening comprehension greatly exceeded reading comprehension, some (visual) decoding component might be responsible for the deficit. Literal comprehension questions were asked following completion of passages. Thus, the subjects had to understand the passages and retain the information for a test; there was a distinct memory requirement in the task.

Two vocabulary tasks were employed that tested knowledge of the words used in the comprehension passages. Thus, if there was any comprehension deficit, it was possible to observe whether the deficit was due to a lack of word knowledge. The vocabulary tasks had a minimal memory requirement. Finally, a decoding task, presented at four different speeds, was given. The decoding tasks made it possible to account for any comprehension problems by reason of problems in lower-level, perceptual encoding mechanisms.

The Literacy Assessment Battery (LAB)

Sticht and Beck (1976) developed the Literacy Assessment Battery (LAB) for the Air Force Human Resources Laboratory to assess the listening and reading skills of young adults. Developed and normed using a population of readers very similar in abilities to those found in the ART program, the LAB provides a direct comparison of the listening and reading paragraph comprehension abilities. It also provides a decoding task presented at four different speeds as well as two vocabulary tasks.

The LAB presents two paragraphs written at about the ninth grade level, auditorily. Following each, the students must answer 12 literal comprehension questions. The questions are presented orally and the responses are written. Students are also presented two passages to read, written at about the ninth grade level. Following each, students answer in writing 12 literal comprehension questions. The spoken and written passages are presented alternately.

The vocabulary portion of the LAB comprises two 28-item sections. In the first, a short phrase is presented in the test booklet and a single word is underlined. At the same time, the phrase is read to the subjects. They select the one word (of four) that is closest in meaning. The second section of the vocabulary part of the LAB is identical, except that students read all the items silently, with no spoken message.

In the decoding phase, a passage is read aloud to the subjects while they read along silently. Occasionally, a particular word in the spoken passage and in the written passage does not match. The students circle the mismatch in their test booklets. In every case, the mismatched words are semantically similar and are of the same syntactic class. Readers must construct an internal representation from the written message and compare it to the representation based on the spoken message. The comparison is based upon a common phonetic code (cf. Hanson, 1981; Posner, 1978). Thus, this task may be interpreted as providing an on-line (Chang, 1983), although somewhat obtrusive, measure of decoding. Passages are presented at four different rates: 100, 150, 200, and 250 words per minute (wpm). There are 10 mismatches per passage and passages are presented in order of increasing speed.

Subjects

Seventy-five subjects were used in this study: 47 marginally literate NES and 28 ESL students. The mean Gates-MacGinitie RGL was 6.76 and 5.92 for the NES and ESL students respectively. This difference was significant ($t(73) = 2.33, p < .05$). The mean AFQT score was 35.96 for the NES students and 33.04 for the ESL students. This difference did not approach significance. The primary languages of the ESL subjects was as follows: 14 Spanish, 12 Tagalog, 1 Chinese, and 1 Japanese. This group had more Spanish-speaking students than are normally found in the San Diego ART program.

Procedure

The subjects were tested in two groups. The first group contained 37 subjects and the second 38. The LAB was administered by an audio tape through a high quality reproduction system. The spoken messages were delivered through speakers located at several positions on the ceiling of the room. The spoken messages were clearly audible to all students.

The comprehension section was first. Following a practice written paragraph, subjects were presented with a written paragraph followed by 12 written literal comprehension questions. Subjects then received a spoken paragraph followed by 12 questions. The time for reading or listening was identical for the two passages. Subjects then received a second written paragraph followed by a second spoken paragraph. The vocabulary tasks were next. Subjects received 28 listening and reading vocabulary items followed by 28 reading-only vocabulary items. Identical time was given for both 28-item vocabulary parts. The decoding tasks completed the testing. Following a brief practice passage, subjects performed the 100-wpm decoding task. This was followed by decoding tasks at 150, 200, and 250 wpm. In all, the testing took approximately 1 hour.

RESULTS AND DISCUSSION

Listening and Reading Comprehension

The listening and reading paragraph comprehension results for the two groups of subjects are presented in Table 1. In general, the data show that the NES students were better than the ESL students in both paragraph presentation modes and that comprehension was better by reading than listening. These findings were substantiated statistically. An unequal n analysis of variance was performed on the raw scores and revealed a main effect of native language ($F(1,73) = 21.81$, $MS_e = 25.83$, $p < .001$) and a main effect of paragraph presentation mode ($F(1,73) = 37.30$, $MS_e = p < .001$). The data show that the reading difference between the two groups was smaller than the listening difference. This interaction, however, was not statistically significant ($F(1,73) = 2.86$, $MS_e = 7.81$, $p = .095$).

Table 1
Results of Paragraph Comprehension Task for NES and ESL Subjects

Mode of Presentation	Item N	Correct Responses for Each Subject					
		NES (N = 47)			ESL (N = 28)		
		Mean	SD	%	Mean	SD	%
Listening	24	12.45	3.88	51.9	7.64	4.09	31.8
Reading	24	14.64	4.59	61.0	11.43	3.56	47.6

The reading advantage for the ESL students was not surprising because they probably received formal English reading instruction in their native country and probably received less instruction in spoken English. The reading advantage for the NES students is somewhat interesting. Intuitively, one might expect that the NES students would show an advantage for listening. That is, they might be relatively poor at written comprehension because of factors related to processing printed text (presumably these factors led to a reading weakness and hence their assignment to ART), but their listening comprehension abilities would be relatively better. This expectation, however, was not supported by the data. The reading advantage has been found previously (Sticht, Hooke, & Caylor, 1981) and could be due to greater familiarity with testing in which passages and questions are presented visually rather than auditorily.

Vocabulary

The vocabulary results are presented in Table 2. The data show an advantage for NES students over ESL students ($F(1,73) = 5.22$, $MS_e = 20.99$, $p < .05$) and an advantage for listening and reading over reading alone ($F(1,73) = 7.79$, $MS_e = 5.08$, $p < .01$). The language by presentation mode interaction did not approach significance.

Table 2
Results of Vocabulary Task for NES and ESL Subjects

Mode of Presentation	Item N	Correct Responses for Each Subject					
		NES (N = 47)			ESL (N = 28)		
		Mean	SD	%	Mean	SD	%
Listening and reading	28	24.60	2.60	87.9	23.04	4.38	82.3
Reading	28	23.72	3.19	84.7	21.75	4.73	7.60

The small but reliable listening and reading advantage over reading alone has also been previously noted (Sticht et al., 1981). In the present study, the bimodal presentation could have made encoding the short phrases easier (more automatic), allowing superior access to information stored in memory. The effect did not seem to be due an artifact of the testing procedure. It is conceivable that the listening and reading task would allow the subjects to at least attempt all the items as compared with the reading-alone task where they simply may not complete all items. However, this explanation was not supported by the data. Of the 75 subjects (all completed all items in the listening and reading task), 39 showed the listening and reading advantage, 15 showed no advantage either way, and 21 showed a reading-alone advantage. Of the 39 who showed the listening and reading advantage, 3 did not complete the reading-alone section (13 items were not attempted). Of the 21 students who showed a reading-alone advantage, 2 did not complete the reading-alone section (17 items were not attempted). The 15 who showed no effect either way all completed the reading-alone task.

Decoding

The decoding results are presented in Table 3. The data show a main effect of speed ($F(3,73) = 136.4$, $MS_e = 2.60$, $p < .001$), but no effect of language. There was a slight tendency for the ESL students to be better at decoding at the slower speeds and worse at the faster speeds; however, this interaction did not approach significance.

Differences in Paragraph Comprehension

Group Task Performance

The results from the paragraph data show clearly that the ESL subjects were worse at comprehension performance than the marginally literate NES subjects. The results from the other tasks go some way in accounting for the comprehension results.

The vocabulary tasks clarify the role of word knowledge in comprehension. All the words used in the vocabulary tasks were taken from the comprehension passages and 93 percent of the words were used in the comprehension questions asked following each passage. At a general level, the ESL subjects knew of most of the words in the vocabulary tasks: 57.1 percent of the ESL subjects knew 82.1 percent of the words and 75.0 percent knew 71.4 percent of the words averaged over both tasks. It is of interest to

Table 3
Results of Decoding Task for NES and ESL Subjects

Speed	Items N	Correct Responses for Each Subject					
		NES (N = 47)			ESL (N = 28)		
		Mean	SD	%	Mean	SD	%
100 wpm	10	8.45	1.78	84.5	9.04	1.20	90.4
150 wpm	10	8.02	2.17	80.2	8.00	1.66	80.0
200 wpm	10	6.51	2.39	65.1	6.39	2.20	63.9
250 wpm	10	3.91	2.54	39.1	3.54	2.54	35.4

know, at a more detailed level, the relationship between vocabulary and comprehension. It would be useful to know, given that a subject knows a particular vocabulary word, what the probability is that he will answer correctly a question containing the word. Similarly, it is of interest to know, given a subject does not know a vocabulary word, the probability that a question containing the word is answered correctly. It is possible to compute these relationships from the present data, because most of the vocabulary words were used in the comprehension questions. In the strict scoring procedure used, if more than one vocabulary word was used in a single question, all the words would have to be answered correctly in the vocabulary tasks (although, in general, most comprehension questions contained only one vocabulary word). For the ESL subjects, given they had knowledge of the tested vocabulary, the probability that they answered the question correctly was 0.44. Thus, knowledge of vocabulary certainly did not guarantee comprehension. On the other hand, given that they did not know at least one of the vocabulary words, the probability they answered the question correctly was only 0.30. Apparently, not knowing the meaning of at least one of the words (in the comprehension question) was somewhat harmful to comprehension. Obviously, not every word in all the comprehension questions was tested; nonetheless, the analysis suggests that processes beyond vocabulary knowledge alone are at work in accounting for the comprehension differences between the ESL and NES subjects. At this point it should be mentioned that the NES group did outperform the ESL group on the vocabulary tasks (see Table 2). Thus, lack of vocabulary knowledge on the part of the ESL subjects was likely to be responsible for some of the comprehension difference. However, it was argued that additional mechanisms were at work which served to add to the comprehension differences.

Interestingly, the relationship between vocabulary and comprehension was weaker for the NES subjects. The conditional probability that a subject answered a question right given he knew the tested vocabulary was 0.57. The conditional probability that the subject answered the question right given he did not know at least one of the vocabulary words was 0.55. Like the ESL group, knowledge of the tested vocabulary in the questions did not guarantee correct comprehension. However, not knowing at least one vocabulary word was not as harmful to comprehension to the NES subjects as it was to the ESL subjects. This may have been due to the NES subjects' ability to use context to interpret unknown words. The fact that the vocabulary-comprehension relationship was weaker for the NES subjects than the ESL subjects was not too surprising given the NES subjects knew many of the words.

The decoding results showed there were virtually no differences between the two groups on a task that involved presumably primarily lower level perceptual encoding processes. In the cross-modality matching task used in this study, subjects' responses were presumably based upon a common phonetic code (cf. Hanson, 1981; Posner, 1978). That is, the subjects decoded the written input as well as the spoken input and made a comparison for the matching task. The comparison could be made on the basis of a common phonetic code. The data suggested that the decoding and comparison processes did not differ between the two groups of subjects. Thus, the decoding component evidently did not account for the paragraph comprehension results. This line of reasoning should not be construed as suggesting that the decoding task could not be influenced by higher level syntactic, semantic, or contextual knowledge. However, differential use of this higher level knowledge by the two groups of subjects in this task was not found in the data.

Multivariate Analysis

The preceding discussion attempted to account for the paragraph comprehension difference by comparing NES and ESL performance on the other LAB tasks. While these comparisons provided information of primary importance to this study, it would be of interest to know whether some explanatory power can be gained by performing a multivariate analysis where the reading comprehension score was predicted from the other LAB tasks. Ideally, one would want to perform a large multivariate analysis using all the LAB variables. However, because the ratio of subjects to variables was rather low, such an analysis would not have been useful. To improve the ratio, data from the two vocabulary tasks were combined to yield one score for vocabulary, and the four decoding tasks were combined to yield a single decoding score. The correlation matrices for the four LAB scores (reading and listening paragraph comprehension, vocabulary, and decoding) are presented in Table 4.

Table 4
Correlations Between Literacy Assessment Battery (LAB) Task Scores

Task Variable	RC	VOC	DEC
NES Subjects			
LC	.575**	.089	.022
RC	--	.326*	.302*
VOC	--	--	.418**
ESL Subjects			
LC	.476*	.616**	.405*
RC	--	.600**	.696**
VOC	--	--	.420*

Note. LC--listening comprehension, RC--reading comprehension, VOC--vocabulary, DEC--decoding.

*p < .05.
**p < .01.

A simultaneous multiple regression was performed for each group of subjects. The reading comprehension variable was predicted from the listening comprehension, vocabulary, and decoding variables for the NES and ESL groups separately. For the NES subjects, the overall multiple regression was significant ($F(3,43) = 11.418$, $MS_{res} = 12.541$, $p < .01$) and all the predictor variables accounted for 44.3 percent of the variance in the reading comprehension score. For the ESL subjects, the overall regression was significant ($F(3,24) = 12.043$, $MS_{res} = 5.702$, $p < .01$), and all the predictor variables accounted for 60.1 percent of the variance in the reading comprehension score. The beta weights and standard errors are presented in Table 5 for both groups of subjects. The table shows that listening comprehension played a larger role in predicting reading comprehension of the NES subjects than of the ESL subjects. This difference was verified statistically ($z = 2.51$, $p < .05$).¹ The vocabulary and decoding regression weights were larger for the ESL subjects than the NES subjects, but neither difference was reliable.

Table 5
Standardized Regression Weights for NES and ESL Subjects

Variable	NES (N = 47)		ESL (N = 28)	
	β	SE β	β	SE β
LC	.5535	.1142	.0459	.1670
VOC	.1889	.1257	.3488	.1685
DEC	.2106	.1253	.5310	.1451

Note. LC--listening comprehension, VOC--vocabulary, DEC--decoding.

¹A conservative estimate of the difference between two beta weights is given by:

$$z_{\beta_1 - \beta_2} = \frac{\beta_1 - \beta_2}{\sqrt{SE_{\beta_1}^2 + SE_{\beta_2}^2}}$$

where β_1 is the standardized regression weight for one variable and β_2 is the standardized regression weight for the other variable.

Although the results of the multivariate analysis are a "step removed" from the prior analysis that directly compared the two groups of subjects on the different tasks and, as a result, are more difficult to interpret, they do yield a potentially interesting finding. The large listening regression weight associated with the NES subjects suggests that reading for comprehension and listening for comprehension represent similar underlying processes. This finding has been reported several times in the past (Jackson & McClelland, 1979; Sticht, 1972). However, this does not seem to be the case for the ESL subjects in the study. The small listening regression weight found for the ESL subjects suggests that the ESL group may have used different processing strategies in understanding the spoken messages compared with the written texts. Because a written display is stable, the ESL student can read and reread portions of the text until an acceptable (to the reader) comprehension level is attained. A spoken message on the other hand is transient and does not allow the student to "rehear" a section of the message. The Filipino subjects received at least 1 hour a day of English language instruction in school beginning in the first grade. However, instruction was often not given by NES teachers. As a result, the Filipinos probably have more familiarity with processing written texts than spoken messages in English, which could account for the observed difference. This interpretation is consistent with the paragraph comprehension data (Table 1) that show a marginal interaction between mode of passage presentation (listening and reading) and native language (NES and ESL).

As observed earlier, Table 5 shows that the vocabulary and decoding variables play a larger role in predicting the reading comprehension variable for the ESL subjects than the NES subjects. While this is a potentially interesting finding, the differences in the weights were not statistically reliable (at the .05 level) between the groups.

Task Results for ESL versus Lowest NES Subjects

The claim has been made in this research that the ESL subjects differ from the NES subjects in important ways, and the implicit assumption has been that the cause of the difference stems from the native language. However, while the ESL and NES groups are alike in that their Gates-MacGinitie scores are below the 7.5 RGL (a condition for assignment to the ART school), the NES subjects had a higher mean RGL than the ESL subjects. Thus, it is of interest to know what, if any, effect there is of general reading ability on the pattern of performance on the tasks. It is possible to gain insight into this concern by selecting a subset of the marginally literate NES subjects more closely matched to the ESL subjects in RGL. The 29 NES subjects with the lowest Gates-MacGinitie scores were selected from the original NES pool. Their mean RGL was 5.87 which was almost identical to the 5.92 RGL of the ESL subjects. The performance on all tasks of the low RGL NES subjects is presented in Table 6. It is clear that the pattern of results is similar to that found using the entire set of NES subjects. Selecting the 29 lowest RGL subjects had the effect of merely decrementing, very slightly, the scores on all the tasks. Apparently, then, the ESL group performed differently from a group of marginally literate NES subjects who had a rather low RGL.

Table 6
 Summary of Task Results for 29 NES Subjects
 With Lowest Gates-MacGinitie RGL

Task	Items	Correct Responses		
		Mean	SD	%
Listening comprehension	24	12.34	4.26	51.4
Reading comprehension	24	14.24	4.98	59.3
Listening and reading vocabulary	28	24.24	2.89	86.6
Reading vocabulary	28	23.38	3.09	83.5
100 wpm decoding	10	8.14	1.98	81.4
150 wpm decoding	10	7.79	2.32	77.9
200 wpm decoding	10	6.31	2.59	63.1
250 wpm decoding	10	3.34	2.60	33.4

CONCLUSIONS

The major conclusion from this investigation was that the paragraph comprehension abilities of the ESL students were lower than that possessed by the marginally literate NES students. Evidently, vocabulary knowledge alone did not account for the difference in comprehending the particular paragraphs used in this research, although vocabulary knowledge in general is undeniably important. Moreover, the four speeded decoding tasks revealed essentially no differences between the groups. Thus, the ESL students' paragraph comprehension problems were apparently not due to decoding deficiencies.

One possible cause of the comprehension difficulties experienced by the ESL students was efficiency of processing (cf. Dornic, 1979; Frederiksen, 1980; McLaughlin, Rossman, & McLeod, 1983). The ESL students may have had difficulty constructing higher level meanings from incoming lexical items. Even though they could understand the meaning of particular lexical items, they may not have been able to put the meanings together quickly enough to understand a passage.

In the listening comprehension task, the spoken messages were presented at about 120 wpm--somewhat slower than average speaking and reading rates. This presentation rate proved difficult for the ESL students to follow compared to the NES students (see Table 1). When comparable written information was presented, the ESL students performed better and their performance improved relative to the NES students (the interaction approached significance), perhaps because they could pace themselves through portions of the text that were difficult. The total presentation times for listening and reading were the same, but in reading, the students could slow down where they encountered local difficulties or they could reread earlier portions of the text that they did not understand.

It is interesting to note that efficiency of processing here refers to those processes beyond decoding that underlie comprehension. The four speeded decoding tasks did not differentiate the two groups of subjects.

RECOMMENDATIONS

Much is yet to be learned before we can expect to make significant improvements in the training of Navy bilinguals. Several research areas are indicated.

1. The efficiency of processing issue is potentially important. Specifying in some detail, for example, the speed and linguistic conditions under which comprehension breaks down would be useful.

2. Research that assessed the bilinguals' ability in their native language or assessed "language-free" mental ability would also be useful. Such research would provide insight into the trainability of a particular bilingual.

3. Finally, experimental studies provide information about capability for language in the confined environment of an experiment. How bilinguals use the capability in naturalistic environments is another matter. Thus, field studies that investigated how bilinguals (successful and unsuccessful) use their language abilities in various environments (i.e., Recruit Training "A" School and the duty station) would be important. Such naturalistic observations in combination with the experimental studies would, then, provide a broader picture of the language abilities of bilinguals.

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