

Reading Easy and Difficult Texts in English and Chinese: Strategy Use by Native Speakers of Chinese

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In this study, twenty adult native speakers of Chinese read and verbally reported their thinking processes while reading easy and difficult expository texts in English and Chinese. The subjects' think-aloud reports were collected as evidence of the strategies they used and subsequently analyzed to ascertain whether there were any differences in strategy use when the subjects read passages of differing difficulty in English and Chinese. Although all subjects demonstrated awareness of a variety of reading strategies, the pattern of strategy use in their think-aloud reports suggested that where differences existed, strategies were used more frequently when reading in English than in Chinese, and more frequently for difficult texts than for easy texts. These findings are discussed in the context of current research which has used verbal reports as a source of insights into first and second language reading.

The purpose of this study was to examine the strategies used by native speakers of Chinese while reading easy and difficult expository passages in English and Chinese. Specifically, we analyzed verbal report data to investigate (1) whether differences in strategy use existed among twenty adult native speakers of Chinese when they read English and Chinese, and (2) whether text difficulty affects strategy use when reading English and Chinese. These research questions are explored within the context of current research and practice relative to learner strategies in first and second language reading.

Reading is a complex process in which competent readers orchestrate a number of knowledge sources using a variety of strategies to comprehend

what they read. These knowledge sources include what Smith (1994) refers to as “visual information” which involves awareness of linguistic and print conventions, as well as “non-visual information” which includes the knowledge that readers bring to the process of reading. In their attempts to make sense of what they read, readers resort to a number of strategies, which are deliberate, conscious plans readers execute when processing textual information. These strategies (e.g., previewing text, using headings and subheadings, re-reading, evaluating understanding, etc.) enable them to interpret printed information quickly and efficiently.

In recent years, research on the reading strategies of first and second language readers has become quite sophisticated thanks to the work of a number of researchers (e.g., Block, 1986, 1992; Carrell, 1984; Ericsson & Simon, 1993; Garner, 1987; Kletzien, 1991; Olshavsky, 1976–1977; Pressley & Afflerbach, 1995) who have found that the strategies which readers use when they interact with printed information play an important role in reading comprehension in both first and second language reading. These researchers and practitioners have concluded that successful readers are strategic readers and that non-successful readers often seem to be unaware of how and when to best use strategies when they read. There is also some consensus among the above researchers that different text types require different strategies and that efficient reading strategies are not acquired simply by reading, but that they should be learned through direct, formal instruction.

There appears to be widespread agreement among language and literacy researchers and practitioners that reading strategies developed in a first language tend to be transferred to a second language despite the differences that may exist between first and second languages (e.g., Alderson, 1984; Carrell, 1991; Clarke, 1980; Cohen, 1996). However, the variability which exists among readers in terms of both reading ability and language proficiency raises unanswered questions. For instance, the fact that a strategy appears — or does not appear — in first (L1) or second language (L2) does not indicate where it originated from. It cannot be presumed that the differences in the nature of languages account for the fact that some strategies appear more often in one language than in the other. A variety of factors may influence strategy use in L1 and L2. Clarke (1980), for instance, observed that “limited control over the language ‘short-circuits’ the good reader’s system, causing him/her to revert to poor reader strategies when confronted with a difficult or confusing task in the second language” (p. 206). A similar observation was made by Alderson (1984)

who suggested that nonnative speakers cannot truly become skilled readers in a second language until they have reached “some sort of a threshold or language competence ceiling ... before existing abilities begin to transfer” (p. 21). Carrell (1991) reported that “both first language reading and second language proficiency have significant effects on second language reading ability” (p. 167).

We concur with the above researchers that the level of language proficiency, the level of reading ability, and the type of language used (L1 or L2) are likely to play significant roles in determining the type and amount of strategy transfer from one language to another. While it cannot be assumed that English is always the weaker reading language of all second language learners, our teaching experience suggests that in many cases, nonnative speakers of English are often at a disadvantage using effective reading strategies in English because of potential linguistic, cultural, and other related problems. One of the languages used in the present study (Chinese) provides a prime example of a medium that is different enough from English that the transfer of strategies may not be straightforward. For instance, unlike in English, there is no grapheme-phoneme relationship in Chinese. This means that the Chinese beginning reader of English must learn those correspondences, a strategy never needed in learning to read in Chinese. Conversely, the frequent repetition of about two hundred radicals in Chinese may not necessarily relate to morphological and spelling constraints that are analogous to English. Therefore, some of the strategies that may be routinely used in one language may prove to be unnecessary in another language. According to Field (1984), the transfer of some reading strategies from Chinese to English is likely to be difficult for native speakers of Chinese, in part because of the adjustments which occur in the switch from reading an ideographic language to reading an alphabetic one.

Researchers studying language and reading strategies in first and second language have devised a variety of methodologies for researching, assessing, and teaching reading strategies (see for example Afflerbach & Johnson, 1984; Block, 1986, 1992; Carrell, 1984; Ericsson & Simon, 1993; Fawcett, 1993; Garner, 1987; Kletzien, 1991; Olson, Duffy, & Mack, 1984; Pressley & Afflerbach, 1995). One technique that has been used with varying degrees of success is the “think-aloud protocol” in which subjects verbally report their thinking as they perform a task such as reading. The think-aloud reports can be analyzed and used as the basis for understanding human thoughts and actions. In the case of language and reading

comprehension, the data can also be used to assess strengths and needs which are ultimately used to inform instruction. However, like most of the research methodologies which have been used to examine human thoughts and actions, the uses of think-alouds in investigations of reading has been accompanied by a history of claims and challenges to the reliability and validity of such a methodology. These challenges have generally centered on issues of subject characteristics and task parameters which have affected the completeness, accuracy, and write-ups of verbal reports. For an excellent discussion of many of these problematic issues, see Cohen (1996) for some insightful ways of refining verbal report methods.

While the intent of this paper is not to review all of the studies which have used protocol analysis as an approach of investigating text processing, we refer the readers to the many excellent sources referenced in this paper. Perhaps the two most significant contributions made in this promising area of research to date are Ericsson and Simon's *Protocol Analysis: Verbal Reports as Data* (1993), which provides an excellent synthesis of protocol analysis research and offers a practical set of methodological recommendations for using protocol analysis as a research technique, and Pressley and Afflerbach's *Verbal Protocols of Reading: The Nature of Constructively Responsive Reading* (1995), which provides an outstanding summary of what is known about verbal reports from current research and practice.

A great deal has been learned about reading through protocol analysis despite its limitations as a research technique. Of the many studies conducted to investigate reading strategies using this technique, none, to our knowledge, has studied the use of reading strategies by native speakers of Chinese when reading English and Chinese. The purpose of this study was to investigate the reading strategies used by native speakers of Chinese while reading easy and difficult texts in both English and Chinese. Specifically, we analyzed think-aloud data to investigate (1) whether there were any differences in strategy use among adult native speakers of Chinese when they read English and Chinese, and (2) whether text difficulty affected strategy use when the subjects read in both English and Chinese.

Method

Subjects

Twenty native speakers of Chinese (15 males and 5 females) were selected for this study from a pool of approximately 200 potential candidates. The

criteria for selection included willingness to participate in the study, commitment to spend a minimum of four hours for participating in all phases of the study, and evidence of adequate proficiency in both English and Chinese. Proficiency in English was demonstrated if the subjects had obtained a score of 550 or higher on the Test of English as a Foreign Language (TOEFL¹), while proficiency in Chinese was determined by the level of educational experience completed in the People's Republic of China which included at least a bachelor's degree. This information was verified by consulting available academic records and meeting privately with individual subjects about their proficiency in English and Chinese. As Table 1 shows, the sample consisted of well educated, relatively English-proficient subjects with a TOEFL score average of 593.15 ($SD = 26.02$).

All selected subjects were either studying or working in the United States at the time of the study. They ranged in age from 25 to 48 years old ($M = 35.75$; $SD = 6.04$) and held college degrees (either bachelor's or master's) from China. In all, 14 subjects held doctorates and 6 were completing masters or doctoral degrees at various universities in the southwestern United States. The subjects' majors included business, physics, mathematics, chemistry, engineering, business, and liberal arts. Prior to taking part in this study, the subjects had lived in the United States for periods of time ranging from 2 to 8 years ($M = 4.85$; $SD = 1.67$) and reported having had several years of English language experience overseas ranging from 6 to 18 years ($M = 13.5$; $SD = 3.42$).

Materials

The materials used in the study consisted of expository passages varying in difficulty levels (easy/difficult) in both English and Chinese. The passages were typical of reading materials generally found in American basal readers. The easy passages ranged from 150 to 200 words and had a predetermined 7th grade readability level while the difficult passages were

¹ Some of the subjects had developed their English language abilities beyond the reported TOEFL scores, having resided in the US for several years and having earned advanced degrees in English. Adequate proficiency in the language was important to help ensure complete and accurate verbal reports.

Table 1 General Information about the Subjects (Age, Sex, Major, Degrees, Years of English, Years in U.S., and TOEFL Scores)

Subject	Age	Sex	Major	Degree in China	Degree in U.S.	Years of English	Years in U.S.	TOEFL Score
LSF	36	M	Chemistry	B.S.	Ph.D.	10	4	580
TXS	39	M	History	M.A.	Ph.D.	15	6	610
TXJ	35	M	Engineering	M.S.	Ph.D.	16	7	630
JZW	39	M	Engineering	M.S.	Ph.D.	16	4	580
WCL	38	M	Marketing	B.A.	Ed.S.	16	7	610
QZB	28	M	Math	B.S.	Ph.D.	13	8	600
CXG	35	M	Medicine	M.S.	M.D.	16	5	607
LLS	35	F	Engineering	M.S.	M.S.	16	2	617
LQ	33	M	Statistics	B.S.	Ph.D.	15	6	596
ZWM	44	M	Math	M.S.	Ph.D.	16	5	570
CDD	38	M	Engineering	B.S.	M.S.	15	4	557
CJ	30	F	Agronomy	B.S.	M.S.	15	5	560
GXF	36	M	Engineering	M.S.	Ph.D.	6	3	580
GJ	38	F	Sociology	M.A.	Ph.D.	12	3	567
QM	30	M	Microbiology	B.S.	Ph.D.	18	4	610
ZMC	47	M	Physics	B.S.	M.S.	8	5	570
QSN	32	M	Engineering	A.S.	M.S.	8	5	563
XC	29	F	English	M.A.	M.A.	15	2	633
MZY	25	M	Math	B.S.	Ph.D.	15	5	643
LJ	48	F	Management	M.S.	Ph.D.	9	7	580
<i>M</i>	35.75	—	—	—	—	13.5	4.85	593.15
<i>SD</i>	6.04	—	—	—	—	3.42	1.67	26.02

approximately 250 to 350 words² long with a predetermined 12th grade readability level.³ The English passages were selected from *SRA Reading Laboratory III* (Parker, 1963) which are similar in structure to those typically found in basal readers. The Chinese passages were selected from a Chinese test study guide entitled *A Study Guide to the TOEFL and GRE Tests* (Xie, 1991). Appendix A includes a sample of the passages used in English and Chinese.

² Consistent with methodological recommendations from prior protocol analysis research (e.g., Ericsson & Simon, 1993), an attempt was made to limit all analyses to approximately the same text length (approximately 150 words per passage). This was done in order to control for passage length and therefore avoid a possible confound between passage length and number of strategies used.

³ The passage difficulty levels were predetermined by the authors of the passages using established readability formulas for English and Chinese.

To control for the effect of prior knowledge, an attempt was made to select passages whose topics were generally familiar to the subjects. Given that there are no established ways of accomplishing such a goal, and after much reflection, we devised a simple way of establishing familiarity by first generating a list of familiar topics. Examples of such topics include those frequently found in mainstream print media such as newspapers, magazines, and other leisure reading materials. With the assistance of a group of judges consisting of three reading specialists, we first generated a list of topics thought to be familiar to the subjects. After much discussion and deliberation, consensus was reached to include the following topics: culture, arts, famous people, animals, and popular science. Second, we selected several passages dealing with these topics at each level of difficulty and consistent with the criteria for passage length and readability described above. Third, we offered the subjects the option of self-selecting the topics they wished to read about. This last step was taken as a precautionary measure to avoid a potential confounding source of variance having to do with prior knowledge.

Following established methodological recommendations for increasing the likelihood of obtaining reasonably complete and accurate self-reports (see Ericsson & Simon, 1993 and Pressley & Afflerbach, 1995), each passage was marked with intermittent red dots, placed after one to two sentences. The markings served as a constant reminder for the subjects to verbalize their thoughts while reading.

Design and Procedures

The design involved two languages (English and Chinese) and two levels of text difficulty (easy and difficult). The subjects read two passages (one easy and one difficult) in each language and verbally reported their thoughts while reading the passages. For consistency, the think-alouds were conducted in English when reading English texts and in Chinese when reading Chinese texts. The resulting protocols were tape recorded for purposes of accurate transcription and data analysis. The think-aloud protocol was conducted in accordance with established procedures used in the most current verbal report research literature (e.g., Afflerbach & Johnson, 1984; Block, 1986, 1992; Cohen, 1996; Ericsson, 1980; Ericsson & Simon, 1993; Fawcett, 1993; Garner, 1987; Kletzien, 1991; and Pressley & Afflerbach, 1995).

Prior to conducting the think-alouds, the subjects were briefed about the purpose of the study and trained to think aloud while reading. The

instructions to the subjects were intentionally kept neutral to reduce the likelihood of biasing the subjects' processing in one way or another. They were simply asked to read and say everything out loud regardless of how trivial the thinking might seem. In addition, they were to make a special effort to do so consistently throughout the passages. Since our main goal was to learn as much as possible about the processes people naturally use when they read, we did not give the subjects any specific instructions about how the text might be processed. Pressley and Afflerbach (1995) note that "researcher silence about how the text might be processed is more defensible than directions that prompt particular processes ..." (pp. 132–133). After the procedure was explained and modeled, the subjects practiced reading passages similar to the ones used in the actual study in both English and Chinese. The practice sessions, which lasted between 20–30 minutes, were tape recorded so that subjects could become accustomed to the use of the tape recording device and procedures. The tape recordings were helpful in reviewing the reports and checking for the completeness and accuracy of the reports. The subjects received feedback in reaction to their reports and assistance in refining their think-alouds until they felt comfortable with the procedure. After the practice sessions, a question and answer session took place and individual appointments were scheduled for carrying out the think-alouds analyzed in the present study.

All of the data collection sessions were individually scheduled and all were conducted within a few days immediately following the training sessions so that subjects would remember how to perform think-alouds. In addition, at the beginning of each session, the subjects were reminded of the basic steps for completing the think-aloud activity. While the sessions were in process, the researchers were available to answer questions or provide assistance. The subjects were allowed to choose whether they wanted to read first in Chinese and then in English or vice versa; however, the order of text difficulty was counterbalanced across the two languages. Because the sessions were conducted one-on-one, the duration of the entire experiment varied from 2 to 3 hours per subject.

Data Collection and Analysis

The tape recorded data were transcribed for analysis using a transcription system designed to preserve features of the verbal reports including pause time and repetition. In order to identify the strategies used while reading in Chinese and English, two groups of judges, representing each of the lan-

guages, were hired to work with the authors in identifying the reading strategies used and categorizing them in a meaningful way. The first group consisted of the first author (a native speaker of Chinese) and two reading specialists (both native speakers of English) while the second group consisted of the same author and two native speakers of Chinese who were completing their doctoral degrees in English.

After the purpose of the study was explained and an example discussed, the judges were instructed to independently identify and categorize the strategies using an agreed upon method of analysis for coding the reports and developing a list of strategies used by the subjects. The judges were also provided with a few examples of strategies that are typically made by readers and are commonly reported in the verbal report research literature such as previewing, re-reading, pausing and reflecting on what is read, questioning, making comments, etc. It was agreed that these were only examples of some of the many strategies that a reader might resort to during reading and that they should carefully analyze any other types of strategies that might be used. The following live example demonstrates the use of one such strategy at the beginning of a passage:

SAMPLE PROTOCOL
A MAMMAL OR BIRD THAT WEIGHED ONLY TWO AND A HALF GRAMS WOULD STARVE TO DEATH. [I don't know why it would starve to death. Maybe this is not true]. IT WOULD BURN UP ITS FOOD TOO RAPIDLY AND WOULD NOT BE ABLE TO EAT FAST ENOUGH TO SUPPLY MORE FUEL. [The small...smaller the animals the less they eat so they don't need to eat fast, very fast to ... to live ...].
Note: The verbal reports appear in lower case between square brackets. The strategy is labeled accordingly by the judges.

The method of analysis consisted of first reading the protocol transcripts and marking the parts of the reports containing the strategies. Once the strategies have been identified, the judges were to assign appropriate labels and count the number of occurrences of those strategies. At the conclusion of this task, the judges compared their findings and discussed the strategies identified.⁴ The judges' generated lists of strategies were subsequently compared and discussed relative to the type and number of

⁴ We found that most of the strategies identified had occurred at least 3 times across passage and subjects.

strategies identified across subjects and passages. Throughout this process, whenever a disagreement among the judges occurred with respect to either strategy type or number, a discussion ensued until consensus was reached. In general, a relatively high degree of agreement was reached among the judges with respect to the type and number of strategies identified even before discussion and consensus building took place, as indicated by the Kendall's Tau (Coefficient of Concordance for English: $\omega = .88$; Chinese: $\omega = .89$). The final list of the reading strategies obtained was analyzed for differences in strategy use across languages and passage difficulty levels. The results are presented below.

Results and Discussion

The subjects' think-aloud reports were examined to ascertain whether differences in strategy use existed when the subjects read easy and difficult passages in English and Chinese. The data were analyzed using a repeated measures analysis of variance (ANOVA) with two within-subjects variables: Language (English vs. Chinese) and difficulty level (easy vs. difficult). The dependent variables for each analysis were the average number of strategies invoked by the participants for each of the four conditions. The independent variables were language and text difficulty levels.

Overall Strategy Use. Table 2 presents an overview of the types of reading strategies used by the subjects when they read in English and Chinese. As the data show, 20 strategies were identified by the judges which could be categorized as text-based and reader-based strategies. The text-based strategies (italicized in Table 2) focused mainly on the micro- and macro-structural aspects of text including using syntax (e.g., "I put 'taking' because it had to be a verb"), using context clues (e.g., "The following phrase gives the definition of the word gnomon"), and recognizing text structure (e.g., "I think the first is the statement and the author gives example in the second and third sentences"). The reader-based strategies focused primarily on the reader's reactions to text content including making predictions (e.g., "I guess the story will talk about the Chinese religion"), confirming (e.g., "I agree. That's correct"), and monitoring (e.g., "I am not quite clear what 'wurning up' means"). These strategies seem to reflect the interactive nature of the reading process. To make sense of text, readers construct meaning by interacting with the reading materials using text-based and reader-based strategies.

Table 2 Strategies Used by the Subjects While Reading Easy and Difficult Texts in Chinese and English

Strategy	Description	Sample Responses
Adjusting Rate	The response indicates that the reader is in control of reading and adjusts reading rate based on text difficulty.	"This part is complicated and I have to read it very slowly." "I need to go back to the first paragraph again."
Using Context Clues	The subject uses context to understand text information.	"The following phrase gives the definition of the word-'gnomon.'"
Visualizing Information	The subject makes a mental image of what he/she is reading.	"I am thinking the time when I was on the plane changing my watch."
Using Key Words	The subject reasons with text information using key vocabulary.	"I am looking for the meaning of the word chariot in the following sentences."
Making Predictions	The subject predicts what will happen in succeeding portions of the text.	"I guess the story will talk about Chinese religion."
Monitoring Comprehension	The subject assesses his or her degree of understanding of the text, and attempts to make necessary repairs.	"Now I see what it means." "I am not quite clear what 'burning up' means."
Using Syntax	The subject uses knowledge of language to make sense of printed information.	"No, this is not something about philosophy as I thought earlier. It talks about science."
Translating	The subject switches language codes to confirm understanding.	(The subject translates from one language to another).
Integrating Information	The subject connects new information with previously stated content.	"This must have something to do with 'Moses' mentioned at the beginning of the passage."
Questioning Information	The subject questions the significance of content read.	"Why secondary important?" "What is the first importance?"
Commenting	The subject makes comments and/or evaluates content.	"I don't think it is dragon. The old people said it was dog".

Table 2 (Continued)

Strategy	Description	Sample Responses
Commenting	The subject makes comments and/or evaluates content.	"I don't think it is dragon. The old people said it was dog".
Reacting to Text Information	The subject reacts emotionally to information in the text.	"It is interesting."
Using Familiar Phrases	The subject recognizes the use of previously known phrases.	"Nine layers of the sky were supported by four columns." "That's a phrase you hear from the legends."
Using Text Structure	The subject demonstrates awareness of text structure.	"I think the first is the statement and the author gives example in the second and third sentences."
Confirming Information	The subject confirms or refutes understanding of text information.	"I agree." "That's correct."
Using Prior Knowledge	The subject demonstrates prior knowledge and experience about content read.	"I am familiar with it. Several years ago when I came to the U.S. we set our watch several times."
Using Main Ideas	The subject identifies and uses main idea as a guide for understanding text information.	"The main idea of the text is about Chinese religion and science."
Interpreting Information	The subject assesses and interprets information in text.	"This came to the conclusion of how to determine the rate at which animal grows up."
Paraphrasing Information	The subject substitutes his own words for the original wording of the text.	"The bird would die of hunger" substituted for "The bird would starve to death."

Before comparing individual strategies across languages and difficulty levels, the average number of strategies used per condition was computed to give the reader an overall sense of group differences. The typical number of strategies invoked overall by the participants for each of the four conditions shows that overall, for the Chinese passages, readers, on average, invoked strategies approximately 20 times regardless of the difficulty of the passage, whereas for English passages, readers invoked an average of 27.3

strategies for the easy passage and 36.15 strategies for the difficult passage (see overall means in Table 3). These data suggest that where differences in strategy use existed, more strategies were used in English than in Chinese, and more strategies were used for difficult than for easy passages in English.

Interaction of Language with Text Difficulty. Table 3 displays the means, standard deviations, and *F*-tests for the interaction of language and text difficulty. The results revealed significant interaction effects for sixteen of the twenty strategies invoked by the subjects when they read easy and difficult passages in English and Chinese. These significant interactions follow several different patterns as shown in Table 3. Overall, strategy use generally increased as a function of text difficulty for English passages and either increased, stayed the same, or decreased for Chinese passages.

Strategy Use by Language. Table 4 shows the results obtained when strategy use by language was examined. Significant differences were found for two of the four strategies with no interaction, namely: “using prior knowledge”, $F(1,79) = 73.70, p < .0001$; and “paraphrasing”, $F(1,79) = 45.81, p < .0001$. In both cases, the average number of times these strategies were used was, indeed, significantly higher in English than in Chinese.

The results of this analysis show how strategy choice is affected by the language medium used. Of the sixteen strategies with a significant interaction between language and difficulty level, fourteen showed greater use of strategies in English than in Chinese. The subjects’ reliance on these strategies when reading English passages appears to be consistent with prior L2 research (e.g., Block, 1986, 1992; Carrell, 1991; Clarke, 1979, 1980; Cziko, 1980), which has previously found that reading ability and strategy use tend to be dependent on language proficiency for many second language readers. Research indicates that most L2 readers (including some of our subjects) are likely to encounter difficulties reading English due, at least in part, to their level of language proficiency. We suspect that in an effort to compensate for underlying linguistic and content difficulties, the subjects resort to greater strategy use while reading in the target language. While reading a passage in English, one reader commented, “This part is complicated, and I have to read it very slowly . . . I need to go back to the first paragraph again.” Comprehension monitoring, according to Casanave (1988) is of particular importance to some L2 readers. The process tends to operate rather automatically, particularly for the most proficient readers. Baker and Brown (1984) note that such monitoring is usually not readily observable until some triggering event — confusion or failure to

Table 3—Strategy Use by Language and by Text Difficulty Level

Strategy	Chinese-Easy	Chinese-Difficult	English-Easy	English-Difficult	Univariate Analysis	
	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	F(1,79)	Pr > F
Adjusting Reading Rate	.30 (.57)	.30 (.47)	1.50 (1.32)	2.40 (2.64)	8.15	.055*
Using context Clues	.00 (.00)	.10 (.31)	.05 (.22)	.90 (1.02)	34.62	.0001*
Visualizing Information	.35 (.81)	.10 (.31)	.45 (.83)	1.20 (1.24)	41.04	.0001*
Using Key Words	.10 (.31)	.45 (.69)	.50 (1.15)	2.40 (1.67)	36.45	.0001*
Making Predictions	1.10 (1.07)	.80 (1.15)	.70 (.80)	2.10 (1.94)	41.52	.0001*
Monitoring Comprehension	1.35 (1.57)	2.50 (2.46)	3.10 (2.17)	5.40 (3.63)	4.89	.0299*
Using Syntax	.00 (.00)	.10 (.31)	.00 (.00)	.40 (.82)	10.77	.0015*
Making corrections	.25 (.44)	.15 (.49)	.30 (.57)	.50 (.089)	7.42	.0079*
Translating	.85 (1.46)	.75 (1.52)	.05 (.22)	.55 (.89)	5.45	.0221*
Integrating Information	1.95 (1.43)	1.05 (1.00)	1.55 (1.64)	1.60 (1.73)	9.79	.0025*
Questioning Information	1.50 (1.47)	.55 (.95)	1.30 (1.03)	1.45 (1.43)	16.44	.0001*
Commenting	3.25 (1.92)	2.00 (1.84)	2.15 (2.28)	2.30 (1.95)	8.24	.0053*
Reacting to Text Information	.65 (.88)	.35 (.67)	.55 (.95)	.60 (1.05)	4.03	.0482*
Using Familiar Phrases	.05 (.22)	1.10 (1.29)	.70 (1.59)	1.00 (1.21)	9.13	.0034*
Using Text Structure	1.25 (1.59)	1.60 (1.79)	2.25 (2.24)	1.30 (1.17)	17.55	.0001*
Confirming Information	.15 (.37)	.05 (.22)	1.30 (1.89)	.30 (.66)	20.37	.0001*
Using Prior Knowledge	1.30 (1.34)	1.30 (1.03)	3.60 (3.78)	3.75 (2.36)	.070	.7912
Using Main Ideas	1.75 (2.07)	2.05 (1.70)	2.10 (2.13)	1.95 (1.64)	1.15	.2862
Interpreting Information	3.70 (2.27)	4.20 (2.95)	3.80 (2.71)	4.15 (3.01)	.120	.7248
Paraphrasing Information	.40 (.82)	.95 (1.10)	1.35 (1.35)	1.90 (1.89)	.030	.8573
Overall Mean	20.25	20.45	27.30	36.15		

The means represent the average number of strategies used per condition

* Significant Main Effects

Table 4 Strategy Use by Language

Strategy	Chinese	English	Univariate Analysis	
	Mean (SD)	Mean (SD)	<i>F</i> (1,79)	<i>Pr > F</i>
Adjusting Reading Rate	.30 (.51)	1.95 (2.11)	96.77	.0001*
Using Context Clues	.05 (.22)	.47 (.84)	51.48	.0001*
Visualizing Information	.22 (.61)	.82 (1.10)	41.59	.0001*
Using Key Words	.27 (.055)	1.45 (1.78)	87.56	.0001*
Making Predictions	.95 (1.10)	1.40 (1.62)	13.01	.0005*
Monitoring Comprehension	1.92 (2.11)	4.25 (3.17)	53.72	.0001*
Using Syntax	.05 (.22)	.20 (.60)	10.77	.0015*
Making Corrections	.20 (.46)	.40 (.74)	4.93	.0292*
Translating	.80 (1.47)	.30 (.68)	15.41	.0002*
Integrating Information	1.50 (1.30)	1.57 (1.66)	.030	.6893
Questioning Information	1.02 (1.31)	1.37 (1.23)	6.38	.0136*
Commenting	2.62 (1.95)	2.22 (2.09)	5.56	.0209*
Reacting to Text Information	.50 (.78)	.57 (.98)	.060	.4401
Using Familiar Phrases	.57 (1.06)	.85 (1.33)	3.91	.0516
Using Text Structure	1.42 (1.67)	1.77 (1.83)	3.49	.0653
Confirming Information	.10 (.30)	.80 (1.48)	27.61	.0001*
Using Prior Knowledge	1.30 (1.18)	3.67 (2.87)	73.70	.0001*
Using Main Ideas	1.90 (1.87)	2.02 (1.87)	.14	.7076
Interpreting Information	3.95 (2.61)	3.97 (2.83)	.05	.8216
Paraphrasing Information	.67 (.99)	1.62 (1.64)	45.81	.0001*
Overall Mean		20.31		31.67

The means represent the average number of strategies used per condition.

* Significant Main Effects.

comprehend, occurs. Indeed, the readers in this study demonstrated awareness of strategy use, and achieved great success at detecting and “fixing” many of the inconsistencies they encountered while reading.

Strategy Use by Text Difficulty Level. Table 5 shows the results of overall strategy use while reading easy and difficult texts in English and Chinese. The results revealed significant differences for two of the four strategies which did not show a significant interaction effect, namely interpreting, $F(1,79) = 4.63$, $p < .0345$; and paraphrasing, $F(1,79) = 19.26$, $p < .0001$. In both of these cases, strategy use was significantly greater for difficult than for easy passages.

Table 5 Strategy Use by Text Difficulty Level

Strategy	Easy	Difficult	Univariate Analysis	
	Mean (SD)	Mean (SD)	<i>F</i> (1,79)	<i>Pr</i> > <i>F</i>
Adjusting Reading Rate	.90 (1.17)	1.35 (2.15)	9.03	.0036*
Using Text Structure	1.75 (1.98)	1.45 (1.50)	4.46	.0380*
Visualizing Information	.40 (.81)	.65 (1.05)	13.39	.0005*
Using Key Words	.30 (.85)	1.43 (1.60)	95.74	.0001*
Making Predictions	.90 (.96)	1.45 (1.71)	15.21	.0002*
Monitoring Comprehension	2.23 (2.07)	3.95 (3.40)	42.28	.0001*
Using Syntax	.00 (.00)	.25 (.63)	24.69	.0001*
Making Corrections	.28 (.51)	.33 (.73)	.630	.4280
Translating	.45 (1.11)	.65 (1.23)	2.90	.0927
Integrating Information	1.75 (1.53)	1.33 (1.42)	6.41	.0133*
Questioning Information	1.40 (1.26)	1.00 (1.28)	15.28	.0002*
Commenting	2.70 (2.15)	2.15 (1.87)	6.85	.0106*
Reacting to Text Information	.60 (.90)	.48 (.88)	2.01	.1607
Using Familiar Phrases	.38 (1.27)	1.05 (1.15)	23.33	.0001*
Confirming Information	.73 (1.47)	.18 (.50)	33.21	.0001*
Using Context Clues	.03 (.16)	.50 (.85)	53.25	.0001*
Using Prior Knowledge	2.45 (2.79)	2.53 (2.18)	.110	.7444
Using Main Ideas	1.93 (2.08)	2.00 (1.65)	.700	.4039
Interpreting Information	3.75 (2.47)	4.18 (2.94)	4.63	.0345*
Paraphrasing Information	.88 (1.20)	1.43 (1.60)	19.26	.0001*
Overall Mean	23.81	28.34		

The means represent the average number of strategies used per condition.

* Significant Main Effects.

Of the sixteen strategies which showed a significant interaction between language and difficulty level, ten were used more frequently for difficult than for easy passages (see Table 3). This finding is not too surprising in light of the fact that difficult texts are more linguistically and cognitively demanding than easy texts. Indeed, the subjects invoked a variety of monitoring and “fix-up” strategies in an attempt to control and regulate their comprehension processes. They also tended to use certain strategies flexibly and adjust their use to the difficulty level of the passage they read. One reader, who recognized the use of a familiar phrase while reading, commented, “That’s a phrase you hear from the legends.” When

reading a difficult text in English, another reader used context clues as a strategy to understand the meaning of a word and said, "The following phrase gives the meaning of the word 'gnomon.'" Overall, the results make good common sense: Subjects resorted more often to explicit strategy use when reading English and when reading difficult texts. These findings are consistent with prior research by Pressley and Afflerbach (1995) who have stated that "active and strategic efforts at meaning construction only occur in reaction to more challenging texts" (p. 14) resulting in "substantial verbalization of information not explicitly given in the text" (Ericsson & Simon, cited in Pressley & Afflerbach, 1995, p. 13).

Conclusion

The results of this study have shown that the subjects demonstrated awareness of a variety of reading strategies while reading English and Chinese. The overall pattern of strategy use in their think-aloud reports suggest that where differences existed, reading strategies were used more frequently in English than in Chinese, and more frequently for difficult texts than for easy texts. In the majority of cases, the presence of significant interaction effects simply reflects the fact that for the Chinese passages, the number of strategies used did not dramatically change between the easy and difficult passages, while for English, strategy use generally increased when going from easy to difficult passages. However, while the majority of the strategies identified were used by the subjects in both English and Chinese, it is unclear whether the strategies learned in one language may operate alongside those learned in a second language, as previously maintained by L2 researchers (e.g., Carrell, 1991; Cohen, 1996; Cziko, 1980). Whether the use of specific strategies can be transferred across languages or originate from one language or another is an important research question which should be systematically investigated.

The results obtained provide additional research support to the findings of several L1 and L2 researchers (e.g., Afflerbach, 1990; Baker & Brown, 1984; Block, 1992; Carrell, 1991; Clarke, 1979, 1980; Cziko, 1980; Kletzien, 1991; Olshavsky, 1976–1977) who have investigated the use of reading strategies by first and second language learners. These researchers, and others, have found that good readers are more aware of the strategies they use than poor readers. Good readers also tend to invoke strategies more flexibly, adjust strategy use to text type and purpose for reading, (e.g., Olshavsky, 1976–1977; Olson, Duffy, & Mack, 1984), are able to success-

fully detect and correct inconsistencies encountered while reading (e.g., Garner, 1987), and are more careful at monitoring their comprehension processes (Baumann, Jones, Sieffert-Kessel, 1993; Block, 1992; Wade, 1990). However, while the readers in this study appear to fit the profile of “good readers” described in most L2 research, we should stress the fact that the subjects in this study were generally well educated, relatively fluent speakers of English. Because of the type of participants used in this study, no definitive conclusions can be made with respect to strategy use by less proficient L2 readers.

Finally, consistent with prior research, it appears that the process thinking aloud while reading increases one’s awareness of oneself as a reader and of how one interacts with text information (Cohen, 1996) as demonstrated by the subjects in this study. Becoming aware of the strategies one uses while reading can lead to positive outcomes for first and second language readers. Such information should allow readers to gain insights into their reading strengths and weaknesses and to plan appropriate instructional intervention. However, while the ultimate goal of studying reading strategies is an applied one, it is difficult to speculate about the teacher’s role in helping students become strategic readers. We concur with Gu (1996) who has called for further study of the effects of strategy training on first and second language reading, and for teachers to become aware of the importance of reading strategies before such training can be incorporated in the classroom.

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Appendix A

ENGLISH PASSAGE EASY VERSION

Every animal is a living radiator. Heat formed in its cells is given off through its skin. Warm-blooded animals maintain a steady temperature by constantly replacing lost surface heat. Smaller animals, which have more skin for every ounce of body weight, must produce heat faster than bigger ones. Because smaller animals burn fuel faster, scientists say they live faster.

The speed at which an animal lives is determined by measuring the rate at which it uses oxygen. A chicken, for example, uses one-half cubic centimeter of oxygen every hour of each gram it weighs. The tiny shrew uses four cubic centimeters of oxygen every hour for each gram it weighs. Because it uses oxygen eight times as fast, it is said that the mouse-like shrew is living eight times as fast as the chicken. The smallest of the warm-blooded creatures, the hummingbird, lives a hundred times as fast as an elephant.

There is no limit to how small a warm-blooded animal can be. A mammal or bird that weighed only two and a half grams would starve to death. It would burn up its food too rapidly and would not be able to eat fast enough to supply more fuel.

ENGLISH PASSAGE DIFFICULT VERSION

The Chinese of 3500 years ago believed that the earth was a chariot, and the sky a curved canopy stretched above it. The canopy was nine layers thick, and it sloped slightly to the northwest, as a cataclysm had broken one of its supporting columns. This gentle slope explained the movement of the stars from east to west.

According to these ancient Chinese beliefs, the sun spent the night on earth and ascended to the sky each morning from the luminous valley of the east by climbing the branches of an immensely tall sacred tree. To the Chinese people, the sun was the incarnation of goodness, beauty, and truth. In popular imagination, the sun was represented as a cock that little by little assumed human form. His battles with the dragons, which personified evil in their beliefs, accounted for the momentary disappearances of the sun that men now call eclipses. Many of the Chinese people worshiped the sun, but in the vast and complicated organization of the Chinese gods, the sun was of only secondary importance.

Along with these unsophisticated beliefs about the sun, the Chinese evolved a science of astronomy based upon observation — through essentially religious — which enabled them to predict the eclipses of the sun and the movement of the stars. Such predictions were based on calculations made by using a gnomon — an object whose shadow could be used as a measure, as with a sundial or simpler shadow pointers. Moreover, with the naked eye, the Chinese observed sunspots, a phenomenon not then known to their contemporaries.

CHINESE PASSAGE
EASY VERSION

摩西祖母已跻身于20世纪美国最著名的画家行列，然而她是70多岁以后才开始作画的，如同她曾说过的，“我绝不坐回到摇椅里，等着什么人来帮助我，”无人能拥有一个(比她)更多产的老年时期。

安娜·玛丽·罗伯逊出生在纽约州的一个农庄，是(家庭中)5男5女中的一个(“我们像小萝卜一样成串地出生”)。她12岁时离开家去当家庭帮工，27岁时她和雇主的助手托马斯·摩西结婚。他们一生中绝大部分时间都在务农，先在弗吉尼亚州，后来在纽约州的英格布里奇。她生了10个孩子，其中的5个活了下来，她的丈夫在1927年去世。

摩西祖母在孩提时期很少画画，作为爱好，她给制绣花图案，直到老年，手变得太僵硬无法缝制(东西)了，她才转移到油画上来。她乐意忙着干点活儿来打发时间，她的画开始是在当地一家药店和定期集市上出售，不久(她的画)开始为一位商人所注意，他购买她画的每一件作品，其中的3幅在现代艺术博物馆展出。1940年，她在纽约举办第一次个人画展。从1930年直到她去世为止，她创作了2000多幅画，以详细而充满活力(的笔触)伴之以奇迹般的色彩意识和形式，去描绘她多年来所熟知的田园生活。

她说：“我构思很艰难，只有我想起一些真正美丽的事物，我才开始作画。”

CHINESE PASSAGE
DIFFICULT VERSION

早期统计学方法的发展受到两种大相径庭的影响。统计学有一位“母亲”，她用于保存政府单位有条理的纪录(State和Statistics来源于相同的拉丁语词根Status)，和一位彬彬有礼的“父亲”，他依靠数学去增进其竞争的技能。这位“母亲”对后代统计学的影响表现为：计算、测量、描述、列表、整理及摘要，所有这些导致了现代描述统计学(的出现)。从这位“父亲”的影响中产生了现代推论统计学，它坚实地基于概率原理之上。

描述统计学包括资料的列表、叙述和制图集成。这些资料可以是数字变量，诸如高度的测量、智力或等级水平，由基础的连续统一体表示其特性，或者可以是性质的变量，诸如性别、学院专业或人格类型。大量的资料在能够被领会之前，通常需要经过一个摘要或缩减的过程，描述统计学是用于描述、概括或缩减浩瀚资料使之成为可理解形式的一种工具。

推论统计学是一种解决其他种类问题方法的定形主体，这些问题给人们无助的头脑带来极大的困难，这类综合问题包括使用观察例证去作出预报的。例如，一位学校主管人想在一个大范围的学校系统内确定来吃早餐的学生比例，或是接种了流感疫苗学生的比例，以及其他诸如此类的事；(如果)有一些统计学知识，(那么)这位主管人就会知道，去查询每个学生是不必要和低效率的，全部管区的比率能够从一次100个孩子的典型调查中相当精确地估算出来。这样，推论统计学的意图是通过部分人口调查的特点信息去预报全体居民的特点。

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