Comprehension monitoring in first and foreign language reading

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ABSTRACT

This paper presents a study of comprehension monitoring of Chinese lower intermediate EFL (English as a foreign language) learners in first language (L1) and foreign language (FL) reading. It investigates the outcome of comprehension monitoring in L1 and FL reading, as well as the separate contributions of L1 reading proficiency and FL comprehension monitoring to FL reading proficiency. 126 students in the vocational department of a foreign languages university in China participated in the study. They completed a Chinese and an English error detection task, in which they were asked to read two texts in each language embedded with external and internal inconsistencies. Measures of Chinese and English reading proficiency were obtained from the mid-term examinations. Four of the 126 readers also participated in retrospective interviews in which they explained the basis on which they had identified the textual inconsistencies and also offered possible corrections. Quantitative data from the two error detection tasks and the reading scores were analyzed using

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repeated measures ANOVA (Analysis of Variance) and multiple regression analysis. Supplementary qualitative data from the retrospective interviews were analysed using content analysis. The results showed that participants performed significantly better in comprehension monitoring in L1 reading than in FL reading. They also showed that FL comprehension monitoring made a small, unique contribution to FL reading proficiency, but that L1 reading proficiency made a much larger contribution. The results suggest that metacognitive control does play a role - albeit a small one - in FL reading.

INTRODUCTION

Reading cannot be successful without comprehension. Comprehension is a complex, dynamic process in which the reader plays an active role in constructing meaning from the text by using available skills and strategies (Block, 2004; Graves, Juel, & Graves, 1998). In the process of meaning construction, comprehension monitoring is an important factor (Alexander & Jetton, 2000; Auerbach & Paxton, 1997; Pressley & Afflerbach, 1995; Zinar, 2000), as it enables a reader to keep track of what he/she is reading in order to make sure it makes sense (Wray, 1994).

Comprehension monitoring is one aspect of metacognitive control in reading comprehension (Baker & Brown, 1984; Brown, 1987; Hacker, 1997; Oakhill, Hartt, & Samols, 2005; Pressley & Ghatala, 1990; Wagoner, 1983; Wray, 1994; Zabrucky & Commander, 1993). It is the process by which "an individual evaluates the state of his/her understanding of information" (Oakhill, Hartt, & Samols, 2005, p.658), and it "directs the reader's cognitive processes as he/she strives to make sense of incoming textual information" (Wagoner, 1983, p.328). It is the awareness of whether comprehension is occurring and the conscious application of appropriate strategies to correct comprehension (Baumann, Jones, & Seifert-Kessel, 1993; Zipke, 2007). Brown (1987) postulated that effective comprehension monitoring requires a balance of both automatic and

controlled processes. When comprehension is occurring smoothly, the process is automatic without much conscious attention; but when a "trigger event" takes place, controlled processing is activated to "debug" comprehension breakdowns.

Comprehension monitoring has been widely researched for native English speakers' reading (Baker & Anderson, 1982; Baker & Brown, 1984; Flavell, 1981; Garner & Anderson, 1982; Markman, 1981; Pressley & Ghatala, 1990; Yuill & Oakhill, 1991; Zabrucky & Ratner, 1992; Zinar, 2000). However, the comprehension monitoring of foreign language readers has not been well documented and there is a dearth of studies in which a cross-lingual comparison is made of comprehension monitoring of the same reader when they read in their first language and their foreign language. The present study compares the comprehension monitoring of Chinese students learning English as a foreign language (EFL) in their Chinese reading and English reading.

A central issue in FL reading research is the transfer of reading skills from L1 to FL. In this transfer, metacognitive skills are thought to play an important role (van Gelderen, Schoonen, de Glopper, Hulstijn, Simis, Snellings, & Stevenson, 2004). It has been claimed that the transfer of metacognitive skills to the foreign language can be hindered by lack of fluent lower-level processes, such as word recognition. According to Koda (2005), lower-level decoding efficiency in FL is influenced by the orthographic distance between L1 and FL . If the L1 and FL orthographies are very different, this may place a particularly large burden on readers' lower-level processing (Birch, 2007). This may make the transfer of higher-level metacognitive skills more difficult than when the two languages are orthographically similar. Consequently, the examination of comprehension monitoring of the same Chinese readers reading in Chinese and English is of significance, as Chinese is an ideographic language, whereas English is an alphabetic language (Birch, 2007).

Previous L1 reading research has indicated that comprehension monitoring makes a small but significance contribution to reading

comprehension (e.g., Zinar, 2000). FL componential studies have also found that metacognitive knowledge and L1 reading proficiency each make a large contribution to FL reading proficiency (e.g., Schoonen, Hulstijn, & Bosser, 1998; van Gelderen *et al.*, 2004). However, it is not known to what extent FL comprehension monitoring, which is one aspect of metacognitive control, and L1 reading proficiency contribute to FL reading proficiency. Therefore, the present study will examine the contributions of both FL comprehension monitoring and L1 reading proficiency to FL reading proficiency.

THEORETICAL BACKGROUND

The major goal of reading is to make sense of the text rather than just to decode the words in the text (Adams, 1990; Blachowicz & Ogle, 2001; Goodman, 1973; Tang, 1997; Wagoner, 1983). This sense-making activity involves highly complex processes, which can be categorized into lower-level processes and higher-level processes. Lower-level processes refer to linguistic processes, such as recognising the meaning of words and storing groupings of words according to basic grammatical information (Grabe & Stoller, 2002). Higher-level processes refer to processes involved in global comprehension of the text, such as the interpretation of information according to the reader's background knowledge, the co-ordination of main and supporting ideas, and the ability to monitor comprehension and use metacognitive strategies to resolve comprehension problems (van Gelderen, *et al.*, 2004). In competent reading, lower-level processes are fast and unconscious automatic processes, which can be carried out simultaneously with conscious processes without any interference; whereas higher-level processes tend to be controlled processes (Segalowitz, 2000).

Metacognition refers to a person's cognition about cognition, thinking about thinking, and knowing about knowing (Flavell, 1987; Flavell, Miller, & Miller, 2002; Paris, Wasik, & Turner, 1991; Phakiti, 2003a, 2003b, 2006; Weinert, 1987). It consists of metacognitive knowledge and metacognitive control. Metacognitive knowledge is located in the long-term memory and is what a person knows about

his/her own cognitive process. Metacognitive control, which functions in individuals' working memory, refers to one's ability to use metacognitive knowledge to achieve certain goals through various cognitive activities, such as planning and monitoring comprehension (Alexander, Schallert, & Hare, 1991; Baker & Brown, 1984; Brown, 1987; Phakiti, 2006; Westby, 2004). Having metacognitive knowledge does not ensure readers will use it to execute metacognitive control (e.g., comprehension monitoring) during reading (Flavell, 1981, 1987; Flavell, Miller, & Miller, 2002; Westby, 2004). In order for metacognitive control to be carried out, readers need sufficient working memory, which requires efficient, fast and attention free lower-level reading processes.

Studies on the comprehension monitoring of English native speakers abound. These studies have usually employed an error detection paradigm, in which readers' comprehension monitoring was examined with a task that required them to detect errors embedded in a text (Garner, 1987). These errors included nonsense words (lexical inconsistencies), information that violates general knowledge (i.e., external inconsistencies), and information that is contradictory within the text itself (i.e., internal inconsistencies) (Oakhill, Hartt, & Samols, 2005).

It has been found that the detection of 'internal inconsistencies' tends to be more difficult than the detection of 'external inconsistencies' (e.g., Ehrlich, 1996; Ehrlich, Remond, & Tardieu, 1999). In order to detect an internal inconsistency, readers must first encode and store the relevant information, draw necessary inferences, and construct a global text representation. They must then be able to evaluate the incoming information against that representation, retrieve the incompatible proposition and then compare the two propositions. For detection of an external inconsistency, readers only need to understand sentences at a local level, and then make a comparison between information in the sentence and their general knowledge, which is likely to be more stable than information just gained from the text (Baker & Zimlin, 1989; Ehrlich, 1996; Ehrlich,

Remond, & Tardieu, 1999; Markman, 1985; Oakhill, Harrt, & Samols, 2005; Otero & Kintsch, 1992).

L1 studies have also examined the contribution of comprehension monitoring to reading comprehension. Zinar (2000) examined the contributions of both word identification skills and comprehension monitoring and found that word recognition made a larger contribution than comprehension monitoring, which made a small but significant contribution to the prediction of L1 reading comprehension.

In FL reading research, the transfer of metacognitive skills from L1 to FL has received attention. For FL readers, metacognitive skills are thought to be learned in L1 reading and subsequently transferred to FL reading. Studies comparing the strategy use of the same readers in L1 and FL reading have indicated that FL readers use more strategies directing their attention to lower-level linguistic processing, such as resolving word meaning or understanding sentence structures, than strategies that direct their attention to higher-level text comprehension processing, such as making inferences or using general knowledge to build a model of global text content (e.g., Davis & Bistodeau, 1993; Horiba, 2000; Stevenson, Schoonen, & de Glopper, 2003; Yamashita, 2002). However, studies have also found that in FL reading, readers employ more metacognitive strategies, such as monitoring or commenting on one's own reading behaviour than in L1 reading (e.g., Davis & Bistodeau, 1993; Stevenson *et al*., 2003; Yamashita, 2002). Recent componential studies also support the transfer of metacognitive knowledge in FL reading. For instance, van Gelderen *et al*. (2004) found that metacognitive knowledge was a large contributor to both L1 and FL reading comprehension.

There is little research on comprehension monitoring in FL reading. Among the few existing studies, most investigated the process of readers' comprehension monitoring by using think-aloud protocols (Block, 1992; Jiménez, García, & Pearson, 1996; Yang, 2002). There is a dearth of studies comparing the outcome of comprehension monitoring of the same readers' L1 and FL reading. The only

study known to the researchers was conducted by Morrison (2004). By using an error detection paradigm, Morrison used premodified texts that contained both micro and macro errors to examine undergraduates' comprehension monitoring in English (L1) and French reading (FL). *Micro errors* were lexical errors, and macro errors were information that either contradicted common knowledge or contradicted information in the text. She found that in L1 reading, students detected more micro errors (66.36%) than macro errors (54.21%), whereas in FL reading, students were more successful in the detection of macro errors (41.98%) than micro errors (38.75%). However, an issue clouding the interpretation of the results was the nature of the micro errors used in the study. The lower scores for FL micro error detection could possibly be explained by participants' lack of FL vocabulary knowledge rather than their failure to monitor comprehension in FL reading. Hence, there is a need for FL studies that examine informational errors rather than errors in the correctness of language use.

THE PRESENT STUDY

The present study examines readers' ability to use metacognitive strategies to achieve reading goals by examining the outcomes of readers' comprehension monitoring. Although the present study only focuses on measuring the levels of success in comprehension monitoring, which is only one aspect of metacognitive control in reading, the comparison of the overall comprehension monitoring performance in L1 reading and FL reading will shed some light on the success of execution of metacognitive control in L1 and FL reading.

The study uses a paradigm in which two kinds of informational errors, external inconsistencies and internal inconsistencies, are embedded in texts. The study examines whether the detection of the two kinds of inconsistencies has a similar pattern in L1 and FL reading. It is expected that, in accordance with the previously mentioned results of L1 studies (Morrison, 2004), the FL readers are

likely to detect more external inconsistencies than internal inconsistencies.

Previous L1 reading research indicated that comprehension monitoring made a small but significant contribution to reading comprehension (e.g., Zinar, 2000). For FL reading, componential studies found that metacognitive knowledge and L1 reading proficiency each made a large contribution to FL reading proficiency (e.g., Schoonen et al, 1998; van Gelderen *et al.*, 2004). However, for FL reading, it is not yet known to what extent actual comprehension monitoring in FL reading and L1 reading proficiency contribute to FL reading proficiency. Therefore, the present study also tests the contribution of comprehension monitoring in FL reading and L1 reading proficiency to FL reading proficiency.

The present study poses the following research questions:

1. Are there any differences between:
   (a) overall comprehension monitoring in L1 and FL reading?
   (b) comprehension monitoring of external inconsistencies and internal inconsistencies across L1 and FL reading?
   (c) comprehension monitoring of external inconsistencies and internal inconsistencies within L1 and FL reading?
2. What are the contributions of L1 reading proficiency and comprehension monitoring in FL reading to FL reading proficiency?

METHOD

Setting

The study was conducted at the Vocational Department of Xi'an International Studies University in Shaanxi Province, China. This department is one of a few in China that offers special English-oriented vocational education to junior-middle school leavers. The

total length of the programme is five years: in the first three years, the students receive intensive training in English. The English courses are composed of Intensive Reading, Extensive Reading, Listening, Oral English and English Writing. For the remaining two years, the students are trained in a specialised vocational area, such as tourism or international trade. These vocational courses are mainly taught in English.

Participants

Altogether, 126 students (41 males and 85 females) from 4 classes in the second year of the programme participated in the study. Their ages ranged from 17 to 19, with a mean age of 18. The average period of English instruction received was 4.5 years. Based on the amount of instruction received and the level of teaching materials used, their level of English proficiency can be said to be equivalent to lower intermediate level.

Participants' scores in the mid-term reading examination for the subject Chinese were obtained as a measurement of their Chinese reading proficiency. The Chinese reading examination consisted of two short passages. After reading the passages, students were required to complete comprehension questions, which included multiple-choice questions and short-answer questions. The total score for the exam is 100, and participants' scores ranged from 53 to 93 (See Table 4 in the Results section).

Participants' scores in the subject Extensive Reading in the mid-term examination were used to measure their English reading proficiency. Extensive Reading is one of the subjects included in English curriculum of most Chinese universities and colleges. In a typical Extensive Reading class, students read passages from a wide variety of materials, such as short stories, news stories and expository texts. The main aim of this course is to equip learners with the skills and strategies to comprehend texts. The Extensive Reading mid-term examination contained five short texts with different kinds of comprehension questions, such as multiple-choice questions and

short-answer questions. The highest achievable score is 100, and participants' scores ranged from 35 to 94 (See Table 4 in the Results section).

Instruments

Chinese and English Error Detection Tasks

The information concerning participants' comprehension monitoring was collected via a Chinese and an English error detection task. The two error detection tasks were specially developed for the study. There were several criteria used to develop the error detection tasks.

Narrative texts were chosen for both Chinese and English error detection tasks, since participants had had experience with this text type in both languages. Moreover, narratives were used rather than expository texts, since understanding narratives requires less domain-specific knowledge. Similar - but not overlapping - topics were chosen. The two Chinese texts are *An Old Father and His Three Sons* (C1) and *A Pretty Young Girl and Her Lover* (C2) (Chen, 2007), and the two English texts are *The Poor Man and His Three Sons* (E1) and *Anya's Garden* (E2) (Bedjos, 1993) (see Appendix A for the sample of the error detection tasks). The two Chinese texts come from Aesop's fables and the two English texts are a Philippine folktale and an Indian folktale. Aesop's fables were selected as these were anticipated to be broadly familiar without being too well-known. Chinese folktales were avoided because it was thought that the participants would be too familiar with the content, and thus, understanding them could be facilitated by their prior knowledge. However, Asian folktales were chosen for the English texts so that the cultures reflected in the texts were not too different from Chinese culture.

The two Chinese texts and the two English texts were of similar length, with the Chinese texts being slightly longer than their English counterparts, in consideration of the fact that there is a gap between participants' Chinese and English reading abilities. The C1 and C2 texts are 704 and 674 words respectively, and the E1 and E2

texts are 601 and 580 words respectively. Finally, in consideration of the participants' proficiency in English, the linguistic difficulty of the texts was checked by several of the participants' English teachers to ensure that they were appropriate for participants' current levels.

Based on previous comprehension monitoring research in L1 reading (Ehrlich, 1996; Ehrlich, Remond, & Tardieu, 1999; Markman, 1985; Oakhill, Hartt, & Samols, 2005; Otero & Kintsch, 1992), two kinds of inconsistencies were embedded, namely external inconsistencies and internal inconsistencies. External inconsistencies contain information that violates general knowledge (e.g., He eats water), whereas internal inconsistencies refer to information that is contradictory within the text itself (e.g., Alice could not open the kitchen door because her key was bent. She walked through the kitchen door). 10 errors were embedded in each text, 5 of which were external inconsistencies and 5 of which were internal inconsistencies. Thus, there were altogether 20 external and 20 internal inconsistencies in each language, and these inconsistencies were scattered throughout the texts. Participants were required to read the texts and to underline the sentences that did not make sense.

The total maximum scores for the Chinese error detection task and the English error detection task were 20. The correct identification of a sentence containing a target inconsistency received a score of 1; an undetected target inconsistency received a score of 0; and an inaccurate location of an inconsistency also scored 0. Analyses indicated that the reliability of the Chinese error detection task was 0.79 (Cronbach's alpha) and the English error detection task was 0.82 (Cronbach's alpha). It is generally agreed that "values above 0.7 are acceptable and values above 0.8 are preferable" (Pallant, 2007, p.98). Hence, the results indicated an acceptable reliability for the two error detection tasks.

Retrospective Interviews

4 of the 126 participants were selected to participate in retrospective interviews. The selection of the participants was based on the following criteria. Due to the small numbers of participants in the inter-

views, it was not practical to include students at all levels of Chinese reading proficiency. Consequently, the selection of the participants targeted those who scored above 70 (the score that reflects average performance according to Chinese academic standards) in Chinese reading, since the current study was concerned with whether proficient L1 readers are able to transfer their L1 reading skills to L2 reading (Davis & Bistodeau, 1993; Tang, 1997). Secondly, two high proficiency (above 85, a High Distinction according to Chinese common academic standard) and two low proficiency (below 60, a Pass according to Chinese common academic standard) English readers were selected based on their English reading scores.

Students A and B were high proficiency English readers, whose English reading scores were 92. Their Chinese reading scores were 93. Students C and D were low proficiency English readers, who scored 40 and 49 respectively for English reading, and 75 and 72 respectively for Chinese reading. For the Chinese error detection task, participants A, B, C, and D scored 16, 18, 14 and 15 respectively. The scores in the English error detection task for students A, B, C, D were 13, 14, 8, and 4 respectively. For a summary of scores of the four participants, see Table 1.

Since using all four texts was time consuming, and could lead to impatience and fatigue, only one text per language was used. For English, the text *The Poor Man and His Three Sons* was used, and for Chinese, *An Old Father and His Three Sons* was used. Each participant was presented with their own answers for the English and Chinese error detection tasks and the researcher asked each participant exactly the same three questions, concerning: (1) why they underlined the sentence; (2) what exactly was wrong with the sentence; and (3) how they could correct the sentence to make it sound sensible (see Appendix B for instructions of the retrospective interviews).

TABLE 1

Information of the Four Participants in the Retrospective Interviews

Students	Age	Gender	L1 Reading Scores	FL Reading Scores	Scores in Chinese Error Detection Task		Scores in English Error Detection Task	
					Ex	In	Ex	In
A	17	F	93	92	8	8	4	9
B	16	F	93	92	8	10	7	7
C	16	F	75	40	7	7	4	4
D	17	M	72	49	8	7	2	2

Ex = External In = Internal

Data Analysis

Computer program

Quantitative data were entered into SPSS 15.0 to perform a series of statistical analyses, in which the significance level was set at 0.05.

One-way Repeated Measures ANOVA

One-way repeated measures ANOVAs were used to answer the first research question. Effect sizes are reported for each analysis, in order to interpret whether significant findings are meaningful within the context of the study, or whether they are an artefact of the sample size (Phakiti, 2003b). The effect measure reported is eta-squared (η^2), which is one of the most common effect indices. According to Cohen (1988), an eta-squared value of 0.01 can be interpreted as indicating a small effect size, 0.06 as indicating a medium effect size and 0.14 or greater as indicating a large effect.

For repeated measures ANOVA to provide a reliable measurement, the assumptions of normal distribution and sphericity must not be violated. In cases of violation of sphericity, the Greenhouse-Geisser adjusted *F* test needs to be consulted (Carver & Nash, 2006). The Mauchly's test of sphericity indicated that the data did not meet

the assumption of sphericity. Thus degrees of freedom were corrected using Greenhous-Geisser estimates of sphericity. It turned out that the values of Greenhouse-Geisser adjusted *F* were the same as those when sphericity was assumed.

Content Analysis

In order to supplement findings from the quantitative data analysis for the first research question, qualitative data collected through retrospective interviews were analysed using content analysis. Content analysis is "a careful, detailed and systematic examination and interpretation" of unstructured word-based data in order to identify "patterns and themes" (Berg, 2007, p.303). Before carrying out content analysis, the recordings of retrospective interviews were transcribed and translated from Chinese into English by the researcher (see Appendix C for the sample of transcriptions of retrospective interviews). The transcriptions were double checked for accuracy by the researcher and the translation was checked by a Chinese postgraduate student, who was in her second year of a Master of Arts in Chinese-English translation studies. During the process of analysis, the original responses were also frequently consulted.

The content analysis procedure followed the suggestions made by Brown (2002) by including two phases: marking key points and forming categories. Firstly, the transcriptions of the interview data were read thoroughly and the idea units were identified and highlighted with a code. According to Pereira (1991), an idea unit is a response referring to a single concept, idea or feature in statements" (p. 54). For example, in the statements: "*It doesn't seem possible. How could he sleep for days and days but then come to a small island? It should be he travelled for days and days*", three idea units can be identified:

- the first idea is the recognition of a problem;
- the second idea is identifying the source of the problem; and
- the third idea is the resolution of this problem by providing a possible correction

The coded data were examined in a cyclical manner so that categories emerged (Miles & Huberman, 1994). The emerging categories were then labelled. The selection of appropriate labels took account of the existing literature on comprehension monitoring process (e.g., Block, 1992). However, the categories generated were based on the data obtained in the present study.

Participants' comments in response to each sentence they underlined were classified into three categories that reflected their comprehension monitoring: (1) recognising a problem; (2) identifying the source of the problem; and (3) correction of the problem. In the first phase, when the participants evaluated their comprehension, they either recognised that they had trouble in understanding the sentence containing inconsistent information or they failed to recognise the problem in the sentence. When they realised there was a problem, they might explicitly express it in a statement (e.g., *There must be something wrong; Haha…funny!*); or sometimes they directly pointed out the location of the problem (e.g., *How can it be 'mother'?; 'Eat' does not seem right here*). In the second phase, identifying the source of a problem, the participants pointed out why the sentence they underlined was wrong. This might mean that it contradicted their general knowledge; or that it contradicted information given at an earlier or later point in the text; or that they could not identify the exact source of the problem (e.g., *I used my intuition.; I forget why I underlined it*). In the last phase, correction of the problem, they either provided a correction or they failed to provide one. Examples of the above three phases are displayed in Table 2.

TABLE 2

Classification Scheme and Examples of Qualitative Data

Phases	Situations	Examples
1. recognising a problem	a. explicitly expressing recognising a problem	*It seems not practical.*
		There must be something wrong.
		Haha…funny!
	b. stating the location of a problem	*How does it become **mother**?*
		***Eat** seems not right here.*
		*Not **repair** here.*
	c. failing to recognise a problem	
2. identifying the source of the problem	a. identifying that the problem is caused the text contradicting general knowledge	*It is impossible for them to eat rubbish.*
		Human beings cannot sleep in the river.
		*When they were in famine, how could they **ate and drank extravagantly**?*
	b. identifying that the problem is caused by the text contradicting other textual information given	*In the previous text, it said **the man had three sons**.*
		*The previous text said he **had no gold**, and in fact **the man gave his sons a cat, a rooster and a …** sorry I cannot pronounce it.*
		*How could he **slept for days and days** but then **came to a small island**?*
	c. failing to provide any reasonable explanation	*I judged it on my intuition.*
		I forget why I underlined it, can't remember.
		I felt it should not be like that, am I right?
3. correction of the problem	a. providing a reasonable correction to the problem	*So it must be the second son, not **the second daughter**.*
		Maybe arrows are on the floor or in other rooms, but not in the sky.
		I think they were hungry and had nothing to eat.
	b. failing to provide any correction to the problem	

NB: Words in **bold** indicate the exact words from the texts in the error detection tasks.

Multiple Regression Analysis

To answer the second research question, multiple regression analysis was employed. This involves the prediction of a dependent variable from several independent variables (Coakes & Steed, 2007). The participants' English reading scores were used as the dependent variable and the Chinese reading scores and scores from the English error detection task were used as independent variables. According to Field (2005), when there is past research concerning the influence of predictors on the dependent variable, hierarchical regression should be used. Previous FL reading research indicated that L1 reading proficiency influences FL reading proficiency (e.g., Schoonen *et al*., 1998; van Gelderen *et al*., 2004; van Gelderen, Schoonen, Stoel, de Glopper, & Hulstijn, 2007); but no existing FL research has examined the influence of comprehension monitoring on FL reading proficiency. Thus, the present study used L1 reading proficiency as the first predictor in the regression model and comprehension monitoring in FL reading as the second predictor in the model. In regression analysis, f^2 is used to indicate the effect size. Cohen (1988) provides the following guidelines to interpret the value of f^2: f^2=0.02 is small effect size; f^2=0.15 is medium effect size; and f^2=0.35 is large effect size.

Certain assumptions must be met in order to perform multiple regression analysis. Firstly, it is preferable that independent variables show at least some correlation with the dependent variable (preferably above 0.3) and that the correlation between each of the independent variables is not too high (preferably less than 0.7) (Pallant, 2007). The results of an initial correlation analysis indicated that there was a medium relationship between English reading proficiency and Chinese reading proficiency (r = 0.51), a weak relationship between English reading proficiency and the English error detection task (r = 0.28), and a very weak relationship between Chinese reading proficiency and the English error detection task (r = 0.09). Thus, multiple regression analysis was able to be carried out.

Secondly, for the least squares method to yield reliable estimates, normality and homoskedasticity of the residuals needs to be checked (Carver & Nash, 2006). If the residuals are normally distributed, the graphs of Normal Probability Plot will "lie along a 45 upward sloping diagonal line" (Carver & Nash, 2006: 182). This analysis indicated that the normality assumption was met. When homoskedasticity is met, the residuals in the graph of Regression Standardized Predicted Value will be "randomly scattered in an even, horizontal band around a residual value of zero" (Carver & Nash, 2006, p.183). This analysis result revealed that the homoskedasticity assumption was met.

RESULTS

Descriptive Statistics

Table 3 presents the descriptive statistics for participants' overall scores on the Chinese and English error detection tasks, scores for external and internal inconsistency detection on Chinese and English reading, and the Chinese and English reading scores. The table includes Means, Standard Deviations (SD), minimum (Min) and maximum (Max) scores, total scores, and skewness and kurtosis statistics. Although the values of skewness indicate that scores of overall Chinese error detection, the detection of external inconsistencies and internal inconsistencies in Chinese reading are clustering at the high end, "with reasonably large samples, skewness will not make a substantive difference in the analysis" (Pallant, 2007, p.56).

Research Question 1

The first research question is: Are there any differences between: (a) overall comprehension monitoring in L1 and FL reading; (b) comprehension monitoring of external inconsistencies and internal inconsistencies across L1 and FL reading; and (c) comprehension monitoring of external inconsistencies and internal inconsistencies within L1 and FL reading? Table 4 presents the results of the one-

way repeated measure ANOVA. Table 4 revealed the following patterns.

TABLE 3

Descriptive Statistics of Chinese and English Error Detection Tasks, Chinese and English Reading Scores

Variables	Mean	SD	Min	Max	Total Scores	Skewness	Kurtosis
Chinese Error Detection (Overall)	14.95	3.35	4	19	20	-1.23	.99
Chinese Error Detection (ExI)	7.69	2.01	1	10	10	-1.14	.92
Chinese Error Detection (InI)	7.26	1.73	1	10	10	-1.04	.78
Chinese Reading Scores	73.40	7.94	53	93	100	.07	-.05
English Error Detection (Overall)	9.10	4.43	1	17	20	-.26	-.97
English Error Detection (ExI)	5.10	2.28	1	10	10	-.25	-.96
English Error Detection (InI)	4.00	2.28	0	8	10	-.11	-.94
English Reading Scores	64.80	14.60	35	94	100	-.04	-.69

ExI = External Inconsistencies InI = Internal Inconsistencies

TABLE 4

Results of One-way Repeated Measures ANOVA

Variables	df	F	Mean Difference	*p*	η^2
Chinese Overall-English Overall	1	283.62	5.96	.00	.69
Chinese External-English External	1	132.07	2.60	.00	.51
Chinese Internal-English Internal	1	303.47	3.36	.00	.71
Chinese External-Chinese Internal	1	6.57	.37	.01	.05
English External-English Internal	1	43.12	1.12	.00	.26

Overall comprehension monitoring in L1 and FL reading

There was a significant difference between participants' overall scores on the Chinese error detection task and overall scores on the English error detection task (F (1-124) = 283.62, p<0.05, η^2 = 0.69), suggesting that participants performed significantly better on overall comprehension monitoring in Chinese reading than in English reading. The eta-squared value indicates large effect size (explaining 69% shared variance).

Comprehension monitoring of external inconsistencies and internal inconsistencies across L1 and FL reading

In terms of the difference between the two kinds of inconsistency detection across L1 and FL reading, participants performed better in external inconsistency detection in Chinese reading than in English reading, and the ANOVA results revealed this difference to be significant (F (1-124) = 132.07, p<0.05, η^2 = 0.51). Likewise, their detection of internal inconsistencies in Chinese reading was also significantly higher than in English reading (F (1-124) = 303.47, p<0.05, η^2 = 0.71). For both kinds of inconsistencies, the eta-squared

values indicate large effects (explaining 51% and 71% of the shared variances).

Comprehension monitoring of external inconsistencies and internal inconsistencies within L1 and FL reading

Participants' detection of the two kinds of inconsistencies within L1 and FL reading revealed a similar pattern in both languages. In Chinese reading, the detection of external inconsistencies was higher than the detection of internal inconsistencies. However, the value of eta-squared indicates that the effect of this size is small (F (1-124) = 6.57, p<0.05, η^2 = 0.05). In English reading, they also detected significantly more external inconsistencies than internal inconsistencies (F (1-124) = 43.12, p<0.05, η^2 = 0.26). Here, the value of eta-squared indicates a large effect. Thus, a comparison of the mean differences in Chinese and English, reveals that the participants performed a relatively poorly on monitoring internal inconsistencies compared to external inconsistencies in FL reading.

Supplements from the Qualitative Findings

Qualitative data from the retrospective interviews also reveals some differences between participants' comprehension monitoring in Chinese and English reading. For the three phases of comprehension monitoring classified in the present study, it seems that participants' comprehension monitoring primarily differed in the first phase of "recognising a problem" between Chinese and English reading. They failed to recognize some problems when they read in English. Furthermore, in both the Chinese text and the English text, they underlined some sentences that in fact did not contain any inconsistencies. It seems that, particularly for the Chinese text, they were very critical and even fussy about the selection of vocabulary. This "fussiness" is likely to be attributable to their having a thorough understanding of the meaning of the text. For instance, three of the participants in the interviews underlined the sentence *The three brothers looked at each other and burst into tears*, and the reason for them to underline it was that they believed the Chinese word *liao wang* implied looking at each other from a distance. However, they

thought from the contextual information, that *kan zhe*, which means looking at each other face to face, would fit the context better. In contrast, their explanation of the sentences they underlined in the English text seems to suggest that they misinterpreted the textual information, which led them to underline some correct sentences. For instance, participant D he underlined the sentence *One day, the farmer was very sick***.** When he was asked to explain, he was confidently commented that "'*Sick' means a mental disorder, I remembered the teacher had just taught us that, so it does not fit here. I think it is wrong.*"

Another difference between comprehension monitoring in Chinese and English reading was reflected in the way the participants recognised words in the two languages. In the interviews, no participants revealed that they encountered some unknown or unfamiliar words in the Chinese text. But in the English text, the participants did find some new words, which they succeeded in guessing the meanings of using the context. For instance, three out of the four participants commented that they did not know the word *scythe*, though they still successfully identified the sentence *We want to eat your scythe* as problematic, because they were able to use local textual information *cutting the rice* to guess the meaning.

In summary, in response to the first research question, the results from a series of one-way repeated measures ANOVAs suggested that participants' overall comprehension monitoring in L1 reading was much better than in FL reading. Across L1 and FL reading, regardless of whether external or internal inconsistencies were monitored, they performed better in L1 reading than in FL reading. Furthermore, no matter whether they were reading in L1 or FL, they performed better on external inconsistency monitoring than internal inconsistency monitoring.

The qualitative data also suggested some differences between comprehension monitoring in L1 and FL reading. The major difference was that participants could not recognize problems as easily in FL reading. Secondly, in L1 reading, they were fussier about the

selection of vocabulary, since they had a thorough understanding of the text; whereas in FL reading, they sometimes misinterpreted the meaning of vocabulary and propositions. Lastly, it seems that they did not come across unfamiliar words in L1 reading, whereas in FL reading their attention was directed to guessing the meaning of unknown words by using local textual information.

Research Question 2

The second research question is: What are the contributions of L1 reading proficiency and comprehension monitoring in FL reading to FL reading proficiency? In order to examine the separate contributeions of L1 reading proficiency and FL comprehension monitoring to FL reading proficiency, students' English reading scores were regressed upon their Chinese reading scores and their scores on the English error detection task. The results of the multiple regression analysis are displayed in Table 5.

TABLE 5

Results of Multiple Regression Analysis

Models	Variables	Adjusted R^2	R^2 Change	*t*	*p*	f^2
Model 1	Chinese Reading Proficiency	.26		6.62	.00	.35
Model 2	English Comprehension Monitoring	.30	.04	3.07	.00	.04

Table 6 shows that in model 1 the variable Chinese Reading Proficiency alone explained about 26% variance in English reading proficiency and that this result is large effect size ($R^2 = 0.26$, $p<0.05$, $f^2 = 0.35$). In model 2, addition English Comprehension Monitoring as a variable resulted in an increase in the coefficient of determination of 0.04, from 0.26 to 0.30 with a small effect size ($R^2 = 0.04$, $p<0.05$, $f^2 = 0.04$). This means that the two variables, Chinese Reading Proficiency and English Comprehension Monitoring, together could account

for around 30% of variance in English reading proficiency, and that comprehension monitoring in English reading could separately explain about 4% of variability in English reading proficiency.

Thus, in response to the second research question, the above results show that the readers' L1 reading proficiency and comprehension monitoring in FL reading together explained about one third variance of FL reading proficiency. L1 reading proficiency made a larger contribution than comprehension monitoring in FL reading, which made a small but unique contribution to FL reading proficiency.

DISCUSSION AND CONCLUSION

Comprehension Monitoring in L1 and FL Reading

The present study used Chinese and English error detection tasks to examine the relationship between comprehension monitoring in L1 and FL reading. The study found that students performed significantly better on overall comprehension monitoring in L1 reading than in FL reading. Regardless of whether comprehension of external or internal inconsistencies was monitored, students were more successful in L1 reading than in FL reading. This might suggest that the present participants did not fully transfer comprehension monitoring skills from L1 to FL reading.

There could be two possible explanations for this lack of transfer. Firstly, according to the threshold hypothesis (Alderson, 1984; Clarke, 1979; Cummins, 1979) and processing efficiency hypothesis (Koda, 1996; Segalowitz, 2000), failure to transfer comprehension monitoring skills might be attributable to the participants' limited language competence or to their less efficient lower-level reading processes in FL, which to some extent limit their ability to carry out higher-level comprehension monitoring in FL.

However, another possible explanation is that readers actually carried out more comprehension monitoring in FL than in L1. Several FL reading strategy studies have found that non-native

readers used monitoring strategies more often than native readers did (e.g., Horiba, 1990, 2000) and that the same readers monitored their comprehension more frequently when they read in FL than when they read in L1 (e.g., Davis & Bistodeau, 1993; Jiménez *et al*., 1996; Stevenson *et al*., 2003; Yamashita, 2002). Moreover, both L1 and FL reading studies have demonstrated that there is a tendency towards an increase in the use of comprehension monitoring strategies when readers are faced with more challenging texts (e.g., Coté, Goldman, & Saul, 1998; Horiba, 2000). According to Walczyk's (2000) compensatory-encoding model, compensatory strategies, such as comprehension monitoring, require a sustained re-allocation of controlled processing and are likely to be disruptive of text modelling. This might offer some explanation as to why participants' performance on comprehension monitoring of internal inconsistencies was particularly weak in FL. Comprehension monitoring of external inconsistencies only requires readers to understand sentencees at a local level, whereas monitoring of internal inconsistencies requires readers to integrate information and construct a coherent representation of a text (Rubman & Waters, 2000). This could provide some evidence that it was global text modelling processes that were particularly disrupted in FL reading. However, it should be pointed out that this interpretation remains speculative, as the present study did not provide a measure of readers online comprehension monitoring strategies (e.g., amount of time spent on sentences with or without inconsistencies; time spent rereading).

The Relationship between L1 Reading Proficiency, FL Comprehension Monitoring and FL Reading Proficiency

In the present study, it was found that L1 reading proficiency and comprehension monitoring in FL reading together could explain about one third variance of FL reading proficiency. However, L1 reading proficiency made a much larger contribution to FL reading than comprehension monitoring in FL reading, which made only a small though unique contribution.

The finding that comprehension monitoring made a small but unique contribution to FL reading proficiency is consistent with the results obtained in L1 reading research. For example, Cain, Oakhill and Bryant (2004) tested the contributions of word reading ability and comprehension monitoring to the reading proficiency of children on three occasions, namely when they were aged 8, 9 and 11 years old. These results also showed that word reading ability was a much stronger predictor of reading proficiency than comprehension monitoring, though comprehension monitoring contributed uniquely to reading proficiency on all three occasions.

In FL reading research, the studies of Schoonen *et al*. (1998), van Gelderen *et al*. (2004), and van Gelderen *et al*. (2007) found that metacognitive knowledge made a large and significant contribution to FL reading proficiency. When we compare this finding to the results of the present study, it seems to suggest that comprehension monitoring may make a smaller contribution to FL reading proficiency than metacognitive knowledge does. If this is the case, it is perhaps because comprehension monitoring is only one aspect of metacognitive control. In contrast, metacognitive knowledge is a broader construct that includes not only one's knowledge about how to monitor comprehension during reading, but also knowledge about oneself, about tasks, and about strategies, such as how to approach a reading task and how to evaluate one's use of strategies. Nonetheless, the unique contribution made by comprehension monitoring to FL reading suggests that both metacognitive knowledge and metacognitive control have a role to play in FL reading.

Limitations and Suggestions for Further Research

Owing to the design and scope of the study, the present study has some limitations. First and foremost, the present study has only used an off-line measurement (e.g., numbers of errors detected) to examine participants' comprehension monitoring in L1 and FL reading. It has not measured readers' online comprehension monitoring in L1 and FL reading. Thus it is difficult to know whether poorer comprehension monitoring in FL reading was due to monitoring being

inhibited in FL reading or due to readers' use of monitoring as compensatory strategies in a local level, which influenced text modelling as a whole. Future research should measure both readers' online comprehension monitoring, such as reading time for consistent and inconsistent sentences and numbers of lookbacks, as well as off-line comprehension monitoring, such as numbers of inconsistencies detected and recall of the texts embedded with errors. In this way, both readers' actual comprehension monitoring and the outcomes of their comprehension monitoring processes can be measured.

Secondly, as already mentioned, metacognitive knowledge and metacognitive control might make different contributions to reading proficiency. Future research needs to investigate the separate contribution of metacognitive knowledge and metacognitive control to FL reading proficiency by including variables that measure each of these facets of metacognition.

Thirdly, the present study only uses narrative texts to compare readers' comprehension monitoring in L1 and FL reading. We cannot assume the same results for comprehension monitoring of reading other types of texts. Horiba (2000) provided some evidence that adult native and non-native English readers adopted different reading strategies in narratives and expositions. For instance, they tend to look ahead to anticipate stories, whereas they are more likely to retrospect and relate new information to earlier elements in expositions. The differences in the approach to reading narratives and expositions might result in different processes in comprehension monitoring, which could have an effect on the outcomes of comprehension monitoring in L1 and FL. As using different types of texts would have added a confounding variable, and as the participants in the present study are only lower intermediate level English learners who do not have much experience in reading English expositions, the present study purposely limited itself to a single text type. Future research could use different text types to examine readers' comprehension monitoring in L1 and FL reading.

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APPENDIX A: SAMPLE OF THE ERROR DETECTION TASKS AND SOLUTIONS

Directions: You are going to read two texts in English and two texts in Chinese. Some of the sentences in the texts do not make sense. Some sentences do not make sense because they say something that is not possible (e.g., He eats water.). Other sentences do not make sense because they do not fit in with the preceding story (e.g., Alice could not open the kitchen door because her key was bent. She walked through the kitchen door.). Read the texts carefully and underline the sentences that do not make sense.

Solutions: Bold indicates a falsehood inconsistency; shaded indicates a textual inconsistency. The correct answer is given in brackets after the inconsistent word(s).

The Poor Man and His Three Sons

Long ago in the Philippines, a poor farmer lived with his three sons. The man had worked hard all his life. But he had no gold. His riches were his three sons.

One day, the farmer was very sick. He knew that he was dying. He called his sons to his bed. "My sons, I will die soon. I have no gold. But I do have something for you." The sons listened sadly. They didn't want their father to die.

First, the father gave the oldest son a cat. Then he gave the second daughter (son) a rooster. And to the youngest son he gave a scythe. The father said, "Travel far and wide. Find **a school (the right place)** to trade the rooster, the cat and the scythe. Then you will be happy."

The sons thanked their father for the gold (gifts). The father spoke no more. He had died.

Months passed. Life was hard for the sons. The farm was on poor **trees (land)**. There were no horses or oxen on the farm. The sons had little **rubbish (food)** to eat.

"Father said to trade the cat," said the oldest son. "But who wants to trade for a cat? Everyone on the island has a cat."

"Father said to travel far and wide," said the youngest son. "I will start tomorrow." The youngest son left his brothers. He took the scythe with him. He slept (travelled) for days and days. At last he came to a small island. There he saw some farmers picking rice. He was surprised. They were picking the rice with their hands.

"May I help you? I can cut the rice fast." The youngest son started cutting the rice with his scythe.

The men were surprised. They had never seen a scythe before. "You can cut rice so quickly!" the men said, "What is that in your hand?"

The youngest son said, "It is a scythe. My father gave it to me."

The men talked quietly together. Then they said, "We want to **eat (trade for)** your scythe. We will give you gold."

The youngest son thought for a moment. Then he said, "I will trade with you." He gave the scythe to the men. Then the young man travelled home. He showed his father (brother) the riches.

"I can't believe it!" said the middle son. "Father was right. You need to find the right place to trade."

The next day, the middle son travelled far and wide. He took his rooster with him. At last he found a village without roosters. He slept in the **river (street)** with his rooster. When the sun came up, the rooster crowed. People looked out their windows. "What is that?" they asked.

The middle son answered, "It is my rooster. It is crowing. It wakes me every morning." The people wanted the rooster for their village. They offered gold to the middle son. Happily, the young man took the gold. He returned home with the rooster (rich and happy).

The oldest son said to his brothers, "I don't think I can trade my cat. But my father wanted me to try." He travelled for days and months. At last he came to an island with no cats. The island had problems with rats. The son put his cat down. The cats ran after the rats. Soon there were no more rats.

The people said, "We must have this cat! Will you trade for it?"

"Yes, I will," said the son with a smile. The people gave the young man a bag of gold.

The oldest son went home. He showed his riches to his brothers. The three sons lived happily for many years.

APPENDIX B: INSTRUCTIONS FOR THE RETROSPECTIVE INTERVIEWS

1. I am going to present your own answers of Chinese and English error detection tasks. At first, you will be given some time to read the two texts "The Poor Man and His Three Sons" and "An Old Father and His Three Sons" again, which might remind you of your thoughts when you did the tasks. Then I will point at each sentence you underlined and ask you the following three questions for each sentence:
    - Why did you underline it while you were doing the test?
    - Why exactly did you think what was wrong with it?
    - Can you correct the sentence to make it sound sensible?
2. The reason I want you to do this is I want to find out how students are aware of their understanding of texts when they read English and Chinese texts.
3. You can speak in either Chinese or English or mix the language as long as you feel comfortable.
4. I am going to record what you say so that I can listen to it again.
5. Please note this interview is neither an English test nor a reading test, and there are not right or wrong answers, so just say what you think.
6. Please speak loudly enough so that your voice can be recorded.
7. Now I am going to test the tape recorder for sound quality, please say something.

APPENDIX C: SAMPLE OF THE TRANSCRITPTIONS OF RETROSPECTIVE INTERVIEWS

Underlined Sentences	Reasons	Corrections
1. Then he gave the second daughter a rooster.	*In the previous text, it said **the man had three sons**,*	*so it must be **the second son**, not **the second daughter**.*
2. The sons thanked their father for the gold.	*The previous text said **he had no gold**, and in fact **the man gave his sons a cat, a rooster and a ...** sorry I cannot pronounce it.*	*It should be **The sons thanked their father for the objects he gave them**.*
3. The sons had little rubbish to eat.	***Rubbish**, impossible, it is impossible for them to eat rubbish, it's not possible.*	*So here must be **food**, not **rubbish**.*
4. He slept for days and days.	*It seems not practical. How could **he slept for days and days** but then **came to a small island** (the following sentence)?*	*It should be **he traveled for days and days**.*
5. We want to eat your scythe.	*I don't know this word (**scythe**), but I know it's something wrong. You see here **cutting the rice with his...** (**scythe**, not pronounced), how could he eat something for cutting rice?.*	*Here must be **buy your scythe**.*
6. He showed his father the riches.	*It's not possible, isn't it? **His father died**, how could **he showed his father**?*	*Should be **someone else**, but definitely not **his father**.*
7. He slept in the river with his rooster.	*Human beings cannot sleep in the river,*	*must not be **in the river**.*
8. He returned home with the rooster.	*He **sold the rooster** already, how could **he returned home with the rooster**?*	*Should be **he returned home with gold.***