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Validation of a Chinese Version of Metacognitive Awareness of Reading Strategies Inventory

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Abstract

Problem Statement: Students' metacognition can play a critical role in their reading learning, and their metacognitive awareness of reading strategies has attracted the interest of both educational researchers and teachers. However, there is not an existing questionnaire for the research of students' metacognition on reading in China. An instrument is needed to assess students' metacognitive awareness of reading strategies in the Chinese context.

Purpose of Study: The aim of the present research is to validate the *Metacognitive Awareness of Reading Strategies Inventory* in the Chinese educational context (*MARSI-CN*). This inventory can be used by Chinese teachers to improve their students' reading skills.

Methods: The present research was comprised of two pilot studies and one main study. In the first pilot study, a translated version of the original questionnaire was administered to a sample of 216 students in six different middle schools, and then in the second pilot study, a revised version of the initial translation was tried out on 494 students. Finally, in the main study, the revised *MARSI-CN* was tested with 2119 students. In the second pilot study phase, exploratory factor analysis was applied, and in the main study, confirmatory factor analysis was carried out.

Findings and Results: A three-factor structure of the *MARSI-CN* resulted from the exploratory factor analysis on the second pilot study data. The consecutive confirmatory factor analysis – building on data from the main study – confirmed the three-factor structure and reflected good fit indices (χ^2/df =1.613, RMSEA= .035, TLI= .959, GFI= .960, CFI= .966). Internal

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consistency in the questionnaire, as measured with Cronbach's Alpha, was .863. Test–retest reliability was also high (r= .91, p< .01).

Conclusions and Recommendations: The results from the study help to conclude that the translated and adapted instrument *MARSI-CN* reflects good reliability and validity, and that it can be used in research on students' metacognitive awareness of reading strategies in Chinese middle schools.

Keywords: Metacognition, metacognitive awareness, reading strategies, reading comprehension

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Metacognition can be defined as cognition of cognition (Flavell, 1979; Shimamura, 1994). Most authors distinguish between metacognitive knowledge and metacognitive regulation (Brown, 1987; Flavell, 1976). Metacognitive knowledge is considered to embrace knowledge about regulation strategies, the task, and the self (Krathwohl, 2002). Metacognitive regulation is believed to include monitoring and control (Nelson & Narens, 1994). Moreover, metacognitive regulation mainly deals with the proper use of metacognitive strategies when learners meet with difficulties in the accomplishment of metacognitive tasks (Brown, 1987). Obviously, metacognitive knowledge and regulation are compounded in metacognitive activities and are hard to clearly separate from each other (Efklides, 2009). However, metacognition can be either conscious or unconscious, so metacognitive awareness can be regarded as awareness of metacognition (Schraw & Dennison, 1994). Although unconscious metacognitive processes might also play an important role in learning, conscious metacognitive processes seem to attract the interest of more researchers (Koriat & Levy-Sadot, 2000; Paris, 2002). With conscious metacognitive processes and self-regulation in learning becoming the core issues of concern in educational research and practice, it is natural that metacognitive awareness becomes an important conception brought forward in the reconceptualization of metacognition (Efklides & Misailidi, 2010).

During the past two decades, the relationship between metacognition and reading comprehension has aroused intensive interest among both educational researchers and practitioners. As an interactive and constructive process, effective reading greatly depends on the active involvement of learners, who not only mobilize cognitive resources to complete their reading tasks, but also monitor and control the reading process (Pressley, 2000). Therefore, learners' metacognition plays an important role in their reading comprehension, and furthermore, skilled readers seem to have better metacognitive awareness, as well as knowledge and regulation of cognition, compared to unskilled readers (Snow, Burns, & Griffin, 1998). According to the model of metacognition advanced by Nelson and Narens (1994), skilled readers are aware of their own cognitive processes and are able to regulate those processes. Monitoring and control of reading are two ways to direct the flow of

information between metacognitive and cognitive levels in gaining meaning from a text within certain discourse, and they are also the ways to repair any comprehension failures (Hacker, 1998). Researchers confirm that reading monitoring and control play a critical role in the success of students' reading comprehension (Cross & Paris, 1988; Kolić-Vehovec & Bajšanski, 2006; Huff & Nietfeld, 2009). Moreover, students' knowledge about metacognitive strategies and their active metacognitive control seemingly can be developed over time (Schmitt & Sha, 2009). When students' metacognitive awareness and skills of reading strategies develop with their reading competence in reading instruction, which in turn enhances their reading comprehension, in some sense, their metacognition can even predict their levels of reading comprehension to a great extent (Kolić-Vehovec & Bajšanski, 2001; Kolić-Vehovec, Bajšanski, & Zubković, 2010).

Clear efforts have been made to develop instruments to capture metacognition. For example, the *Metacognition Scale* (*MS*) (Yildiz, Akpinar, Tatar, & Ergin, 2009) was designed for primary school students, the *Junior Metacognitive Awareness Inventory* (*Jr. MAI*; Sperling, Howard, Miller, & Murphy, 2002) for students from grade 3 to 9, and the *Metacognitive Awareness Inventory* (*MAI*; Schraw & Dennison, 1994) and the *Meta-Cognitions Questionnaire 30* (*MCQ-30*; Wells & Cartwright-Hatton, 2004) for adults. Particularly, specific questionnaires have been created focusing on metacognitive awareness of reading comprehension and reading strategies. We discuss three such instruments here. First, the *Index of Reading Awareness* (*IRA*; Jacobs & Paris, 1987) is an inventory with 22 multiple-choice items used to measure children's metacognitive awareness of their reading comprehension process. However, its reliability and validity were found only marginally acceptable (McLain, Gridley, & McIntosh, 1991). Second, the *Metacognitive Reading Awareness Inventory* (*MRAI*; Miholic, 1994) was developed aiming at stimulating students' metacognitive awareness of reading strategies. However, this instrument is an informal multiple-choice inventory without a scoring rubric, thus it had important limitation for use in research. Finally, the *Metacognitive Awareness of Reading Strategies Inventory* (*MARSI*; Mokhtari & Reichard, 2002) was designed to assess students' metacognitive awareness and perceived use of reading strategies. It has consistently been used in educational research and reflects effective validity and reliability.

Since most of the research about metacognition and reading comprehensions has been set up in western educational settings, there is a lack of studies on metacognitive awareness of reading strategies in the Chinese setting in the literature. Moreover, because of the different recognition process of Chinese characters, Chinese characters and their use may result in students' different reading habits and strategies use (Chen, 1996; Li, Shu, McBride-Chang, Liu, & Peng, 2010). For example, because the Chinese characters represent lexical morphemes in contrast to alphabetic symbols, and the relationship between a script and its speech is highly opaque (Chen & Tzeng, 1992), some students may have to use some strategies to memorize the pronunciation of some new characters for them when they read. Meanwhile, students' reading comprehension is still poor in most Chinese secondary schools and needs to be improved (Chen, 2011). Therefore, it is necessary to carry out research on students' metacognitive awareness of reading strategies in China. In fact, a recurrent

theme in the literature stresses the necessity to develop instruments about metacognition of reading that fit the Chinese context (Li, 2004; Liu, Guan, Feng, Fan, & Guo, 2006). In the present research, we responded to the need for contextualized studies and validated the *MARSI-CN* in the Chinese context.

Method

Research Instruments

Metacognitive Awareness of Reading Strategies Inventory (*MARSI*). The inventory *MARSI*, which was initially developed by Mokhtari and Reichard (2002), is a self-report instrument assessing students' awareness and their perceived use of reading strategies in academic or school-related materials. In the original version, the *MARSI* comprises 30 items, clustered in three subscales: global reading strategies (GLOB), support reading strategies (SUP), and problem-solving strategies (PROB). GLOB (13 items) refers to a set of reading strategies commonly used to construct meaning from a text, for example, "I have a purpose in mind when I read." SUP includes 9 items about concrete strategies that help readers to develop meaning from a text. An example item is "I take notes while reading to help me understand what I'm reading." PROB (8 items) represents strategies to solve problems when a text is difficult to read, for instance, "When a text becomes difficult, I read aloud to help me understand what I'm reading." Each item presents a statement and a five-point Likert-type scale ranging from 1 ("I never or almost never do this") to 5 ("I always or almost always do this").

Reading comprehension tests. The tests were used in the study of the concurrent validity of the inventory. Those reading comprehension standardized tests were developed by research groups founded by Ghent University, Beijing Normal University, and South China Normal University, and they each included five texts, with three expository and two narrative. The texts were in Chinese, and each test paper comprised 26 questions.

Research Procedure

The present study was set up along three phases: (1) translation procedure from the original English version of the *MARSI* to a first Chinese version *MARSI-CN* and pilot study 1 (*N*=216); (2) pilot study 2 (*N*=494) on the basis of the adapted version *MARSI-CN* with a focus on determining the basic factor structure of the instrument, using exploratory factor analysis (EFA), and studying the test-retest reliability of the *MARSI-CN*; and (3) a main study, involving a large sample (*N*=2119), based upon the *MARSI-CN*. The latter phase included a confirmatory factor analysis and also a reading comprehension standardized test to examine the criterion validity of the inventory. The three phases could be depicted as in Figure 1.

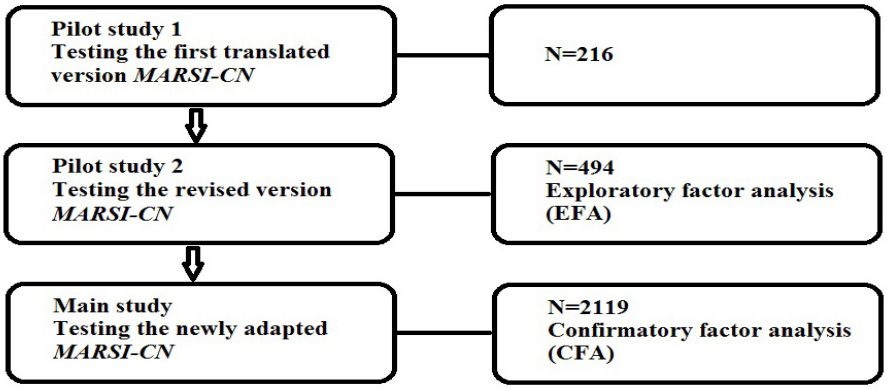

Figure 1. The three research phases

In the present research, the *MARSI* was translated from English into Chinese, following Beaton's guidelines on translation and adaptation of self-report questionnaires (Beaton, Bombardier, Guillemin, & Ferraz, 2000). Two bilingual translators - with Chinese as their mother tongue - from Yulin Normal University, China, independently translated the instrument into Chinese. Next, the authors organized discussions to deal with inconsistencies in the translations and synthesized the two translated versions into a revised version. Two other bilingual translators - with English as their mother tongue – translated the revised version back into English. The revised Chinese version was reviewed by three experts in reading research and administered to 216 students in the first pilot study. Additionally, the authors carried out discussions with 40 students to explore their interpretation of the translated items. Items that were easily misunderstood by students were revised. This resulted in a final revision by the authors. Subsequently, the revised version was presented to 494 students in the second pilot study for the analysis of its structure. Finally, the newly adapted version was carried out among 2119 students in the main study. Meanwhile, a reading comprehension test was given to those students in order to assess the concurrent validity of the inventory. The resulting version - labeled as the *MARSI-CN* - was used in the pilot studies and the main study to examine its reliability and validity.

Research Participants

Students from six middle schools participated in this study. The schools are situated in the Guangdong and Guangxi provinces in south China, the former being one of the most underdeveloped provinces and the latter one of the most developed provinces in China. Among the six schools participated in the study, there are two schools from the city or the suburbs, and four schools from towns. In total, about 17,000 students are enrolled in those six schools. The students that participated were selected following a stratified sampling in grade and then a random sampling in class.

In the first pilot study, 216 students (117 girls and 99 boys) from those schools participated. When the students answered the inventory, they were asked to pick up items which they found hard to understand. Items of *MARSI-CN* that were easily misunderstood by students were revised.

In the second pilot study, there were 494 students, 12 to 17 years old. They were in grades 7-12. Among those students, 54.7% were female (n=270), and 45.3% were male (n=224). 40.1% of them (n=198) were from schools in towns and 59.9% (n=296) were from schools in the city or the suburbs. In our study, there were 53.8% of the students (n=266) whose families live in villages, 15.4% (n=76) in towns, and 30.8% (n=152) in the city or the suburbs. The sample of students in the study represents a variety of students when it comes to gender, age, school location, and family background. 520 questionnaires were delivered among those students, and 494 were accepted as valid. Meanwhile, a retest on 213 students was carried out using the revised instrument to test its reliability.

After factor analysis and adaptation of the *MARSI-CN,* another test with the inventory was administered among 2119 students in Grades 7-8 and Grades 10-11 in order to perform confirmatory factor analysis (CFA) and to report on students' metacognitive awareness of reading strategies. Students' ages were between 12 and 17, and 49.3% of the students were males (n=1044), 50.7% females (n=1075). 50.4% of them (n=1069) were from the schools in towns, and 49.6% (n=1050) from the schools in the city or the suburbs. Among those students, 51.5% of them (n=1091) were from families in the countryside, 27.4% (n=581) from families in towns, and 21.1% (n=447) from families in the city. Meanwhile, a reading comprehension standardized test was carried out among those students, and the students' reading comprehension was used as a criterion for their metacognitive awareness of reading strategies.

Statistical Analysis

Exploratory factor analysis (EFA) using maximum-likelihood extraction and promax rotation was used to determine the structure of the *MARSI-CN*. In pilot study 2 (N=494), EFA was performed using the Statistical Package for the Social Sciences (SPSS) for Windows, version 17.0 (SPSS Inc., Chicago, IL, USA). The retention of items was based on the scree test, as well as a priori criteria because the original *MARSI* has been proved to be clustered in three factors. Internal consistency was assessed by means of Cronbach's alpha, and test-retest reliability was analyzed by using Spearman rank correlations.

In the main study, confirmatory factor analysis (CFA) was conducted to examine the stability of the exploratory three-factor structure of the *MARSI-CN*. Modification indices were used to modify the model and to improve the model fit. Following the non-data-driven principle put forward by McDonald and Ringo Ho (2002), our modification was not only restricted to the data, but it contained a theoretical justification as well. Statistical analyses were performed using the Analysis of Moment Structures (AMOS), version 17.0 (SPSS Inc., Chicago, IL, USA).

Results

Exploratory Factor Analysis

Factor loadings emerged from the analysis (see Table 1 below) and were initially assessed in the retention of items. Items with loadings lower than .50 were considered too low to be accepted as the practical minimum eigenvalue and were therefore deleted from the inventory (Hair, Black, Babin, & Anderson, 2010). Because the eigenvalues of item 1, 7, 10, 12, 14, 18, 22, 23, and 28 were below .50, they were deleted first.

Table 1

Factor Loadings for the MARSI-CN Three-factor Model

Inventory item	Factor		
	1	2	3
1. I have a purpose in mind when I read.	.478		
2. I take notes while reading to help me understand what I'm reading.		.508	
3. I think about what I know to help me understand what I'm reading.	.547		
4. I preview the text to see what it's about before reading it.	.520		
5. When a text becomes difficult, I read it aloud to help me understand what I'm reading.		.504	
6. I write summaries to reflect on key ideas in the text.		.532	
7. I think about whether the content of the text fits my purpose.	.418		
8. I read slowly but carefully to be sure I understand what I'm reading.			.600
9. I discuss what I read with others to check my understanding.		.521	
10. I skim the text first by noting characteristics like length and organization.	.451		
11. I try to get back on track when I lose concentration.			.582
12. I underline or circle information in the text to help me remember it.		.495	
13. I adjust my reading speed according to what I'm reading.			.575

14. I decide what to read closely and what to ignore.	.420		
15. I use reference materials such as dictionaries to help me understand what I'm reading.		.519	
16. When a text becomes difficult, I begin to pay closer attention to what I'm reading.			.635
17. I use tables, figures, and pictures in the text to increase my understanding.	.560		
18. I stop from time to time to think about what I'm reading.			.496
19. I use context clues to help me better understand what I'm reading.	.534		
20. I paraphrase (restate ideas in my own words) to better understand what I'm reading.		.531	
21. I try to picture or visualize information to help me remember what I'm reading.			.559
22. I use typographical aids like boldface type and italics to identify key information.	.442		
23. I critically analyze and evaluate the information presented in the text.	.485		
24. I go back and forth in the text to find relationships among ideas in it.		.554	
25. I check my understanding when I come across conflicting information.	.557		
26. I try to guess what the text is about when reading.	.540		
27. When a text becomes difficult, I reread to increase my understanding.			.608
28. I ask myself questions I like to have answers in a text.		.457	
29. I check to see if my guesses about a text are right or wrong.	.586		
30. I try to guess the meaning of unknown words or phrases.			.530

Note. Factor 1= Global reading strategies (GLOB), factor 2=Support reading strategies (SUP), and factor 3= Problem-solving strategies (PROB).

Moreover, the scree plot of the eigenvalues indicated that the items were clustered in three factors, and item 4, 9, 20, 21, and 29 were deleted in the first trial. After the modification, the retained 16 items in the Chinese version with their factor

loadings are presented in Table 2 below. In the table, all item loadings are over .50 except item 26. However, the factor loading of item 26 is .497, close to .50, and compared to its loading .540 in Table 1, it can remain.

Table 2

Factor Loadings for the 16-item MARSI-CN Three-factor Model

Item number	Factor			Item number	Factor		
	1	2	3		1	2	3
2		.543		16			.652
3	.569			17	.576		
5		.535		19	.516		
6		.538		24		.543	
8			.639	25	.543		
11			.606	26	.497		
13			.540	27			.638
15		.540		30			.523

Note. Ibid. Table 1.

Based on the results of the modifications mentioned above, a three-factor structure was modeled with the 16 items, including five in GLOB, five in SUP, and six in PROB (See Table 3 below). The three factors accounted for 46.3% of the total variance of the *MARSI-CN*. The *MARSI-CN* also used five-point Likert items: 1 means "I never or almost never do this", 2 means "I do this only occasionally", 3 means "I sometimes do this" (about 50% of the time), 4 means "I usually do this", and 5 means "I always or almost always do this".

Table 3

Items in the Chinese-version Metacognitive Awareness of Reading Strategies Inventory (MARSI-CN)

Type	Strategy	Scale				
SUP	1. I take notes while reading to help me understand what I'm reading.	1	2	3	4	5
GLOB	2. I think about what I know to help me understand what I'm reading.	1	2	3	4	5
SUP	3. When a text becomes difficult, I read it aloud to help me understand what I'm reading.	1	2	3	4	5
SUP	4. I write summaries to reflect on key ideas in the text.	1	2	3	4	5
PROB	5. I read slowly but carefully to be sure I understand what I'm reading.	1	2	3	4	5
PROB	6. I try to get back on track when I lose concentration.	1	2	3	4	5
PROB	7. I adjust my reading speed according to what I'm reading.	1	2	3	4	5
SUP	8. I use reference materials such as dictionaries to help me understand what I'm reading.	1	2	3	4	5
PROB	9. When a text becomes difficult, I begin to pay closer attention to what I'm reading.	1	2	3	4	5
GLOB	10. I use tables, figures, and pictures in the text to increase my understanding.	1	2	3	4	5
GLOB	11. I use context clues to help me better understand what I'm reading.	1	2	3	4	5
SUP	12. I go back and forth in the text to find relationships among ideas in it.	1	2	3	4	5
GLOB	13. I check my understanding when I come across conflicting information.	1	2	3	4	5
GLOB	14. I try to guess what the text is about when reading.	1	2	3	4	5
PROB	15. When a text becomes difficult, I reread to increase my understanding.	1	2	3	4	5
PROB	16. I try to guess the meaning of unknown words or phrases.	1	2	3	4	5

Note. GLOB=Global reading strategies, SUP=Support reading strategies, and PROB=Problem-solving strategies. (The Chinese version *MARSI-CN* will be supplied upon request.)

Confirmatory Factor Analysis

In order to study the stability of the exploratory factor structure, we conducted confirmatory factor analyses on the three-factor model of the *MARSI-CN* with 16 items. CFA for the measurement model depicted in Figure 2 resulted in the following indices: NCI (χ^2/df)=161.277/100=1.613<3; RMSEA= .035; TLI= .959; GFI= .960; CFI= .966; PGFI= .706; PNFI= .763. These results met the conventional model fit standards, and indicated a good model fit with the data. In this model, the regression coefficients ranging from .50 to .65 were acceptable and they were all significant in the level of p< .001. The correlation coefficients between GLOB, SUP, and PROB are over .70 (r= .91 between GLOB and SUP, r= .79 between SUP and PROB, and r= .86 between GLOB and PROB), so those factors are highly related. Evidently, the correlation coefficient between GLOB and SUP (r= .91) implies there is a high correlation between the two factors. (See Figure 2 below; the number of items remained the same as in Table 1 for comparison with the original *MARSI* and for analysis in the "Discussion" part.)

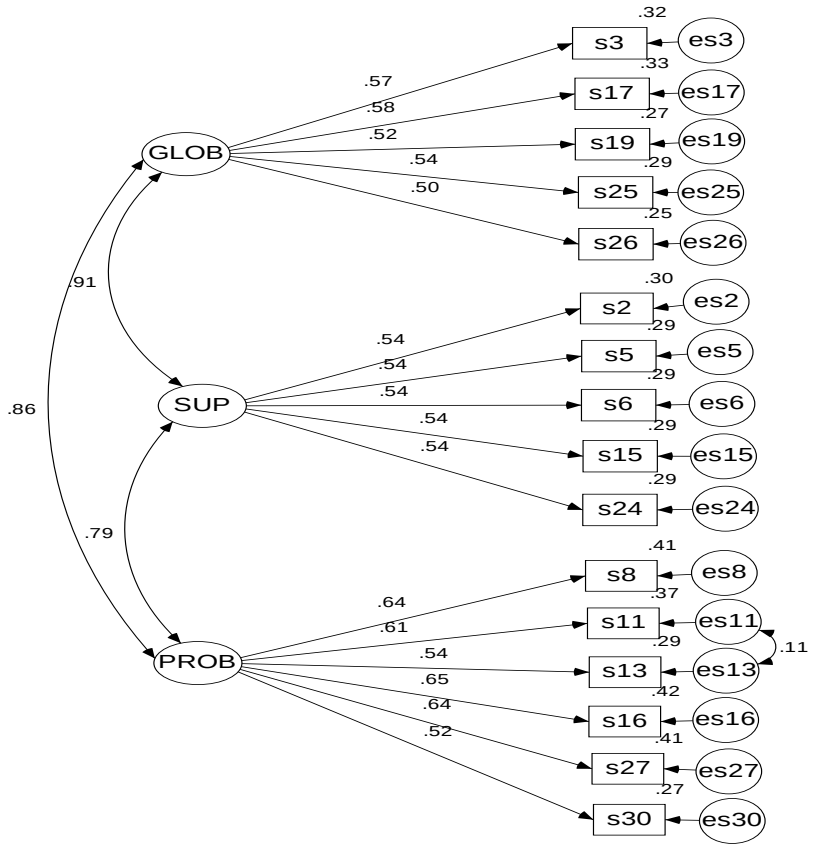

Figure 2. The three-factor model of the *MARSI-CN*

Concurrent Validity

Since metacognitive awareness of reading strategies had been proved to be related to reading comprehension ability (Baker & Carter, 2008), correlation analyses were conducted in this study to determine the degree of association of the *MARSI-CN* with the theoretically related measure – the Chinese reading comprehension test. The reading comprehension standardized tests were administered with the *MARSI-CN* among the same 2119 sample students. In the main study, the *MARSI-CN* was significantly positively correlated with reading comprehension (Pearson's correlation r= .72; correlation was significant at the .01 level). GLOB, SUP, and PROB were also significantly correlated with it (Pearson's correlation r= .58, r= .60, and r= .61 respectively). Partial correlations were also conducted to control for the number of books read the previous month, and the *MARSI-CN* remained significantly correlated with reading comprehension, when partialling out that variable. When the analysis controlled for the number of books read the previous month, correlations between *MARSI-CN* and reading comprehension were r= .71, and correlations between GLOB, SUP, and PROB and reading comprehension were r= .57, r= .58, and r= .60 respectively.

Internal Consistency and Test-retest Reliability

The internal consistency (Cronbach's alpha) of the whole *MARSI-CN* was .863, and that of metacognitive awareness of global reading strategies (GLOB) was .674, metacognitive awareness of problem-solving strategies (PROB) .774, and metacognitive awareness of support reading strategies (SUP) .673. The results of the internal consistency proved that the reliability was satisfactory. The total test-retest fidelity (N=213) was satisfactory with r= .91 (p< .01). As to the subscales, the following test-retest fidelity was found: r= .855 (p< .01) in GLOB, r= .908 (p< .01) in PROB, and r= .889 (p< .01) in SUP. From the results of the internal consistency and test-retest reliability, it could be drawn up that the adapted *MARSI-CN* was a good inventory with satisfactory reliability.

Discussion and Conclusion

In this study, the validity and reliability of the *MARSI-CN* were assessed for further research on students' metacognitive awareness in China. According to the results of the data analysis, the adapted inventory demonstrated good internal consistency, concurrent validity, and satisfactory reliability. As a result, the three-factor model of the *MARSI-CN* is reasonable and acceptable to apply as a research instrument to study students' metacognitive awareness of reading strategies. It could help to achieve deeper insight into reading and it could support reading practice in class. The results from the present research may suggest some new discoveries about the *MARSI-CN* as follows.

First, the results of the present study revealed the possible structure of students' use of reading strategies. Metacognitive awareness of reading strategies reflects students control and monitoring of reading process and reading strategies, and plays

an important role in reading comprehension. The *MARSI-CN* reformulated the *MARSI* developed by Mokhtari and Reichard (2002) and confirmed the three-factor model of metacognitive awareness of reading strategies. The results in the exploratory and confirmatory factor analysis suggested that students' perceived use of reading strategies included global reading strategies, problem-solving strategies and support reading strategies. When students read school related materials, the understanding and use of these strategies will possibly influence their comprehension. Therefore, in reading instruction, teachers have to try their best to foster strategic readers who can use cognitive reading strategies flexibly and control their comprehension (Yaylı, 2010).

Second, the results indicated a cultural adaptation when the *MARSI* came into use in other countries. For example, Ay (2009) adapted it in the Turkish background and developed a Turkish version. In the Chinese learning culture, reading is a different practice in that Chinese students read with different habits, and that they might read with different strategies from those used by students in other countries. In reading classes, students tend to act in a passive role and to be led by teachers, and some of them do not have good habits in reading (Zhou, 2008). When students meet a new character in reading, they often have to use different strategies to memorize the pronunciation of it. Therefore, it is reasonable that the English version *MARSI* developed in the United States should be adapted for use with Chinese students. In our analysis, we reproduced the construct of three subscales from the original questionnaire with 16 items, based on findings of exploratory and confirmatory factor analysis. 14 items of the original questionnaire were deleted, and we think that it is due to the cultural difference and students' reading habits. The remaining 16 items can be accepted as valid because they are in agreement with the Chinese cultural and social background. For example, when Chinese students read school related materials, teachers often expect that they can control the process of reading teaching, and that students can read aloud and recite the texts, so items related to students reading autonomy in the original questionnaire were reasonable to be deleted in the adapted *MARSI-CN*, such as items 1, 9, 18, and 28 in the original inventory. On the other hand, items encouraging reading with some aids remained, such as items 2, 11, and 15 in the original inventory.

Third, the results demonstrated the possible relation between students' metacognitive awareness of reading strategies and reading comprehension ability. The results of data analysis in concurrent validity show that there were significant relations between metacognitive awareness of reading strategies and students' reading comprehension ability. Students can improve their reading performance when they understand and use global reading strategies, problem-solving strategies, and support reading strategies. In an investigation on metacognitive awareness of reading strategies on reading hypertext, Topçu (2007) pointed out that metacognitive awareness of reading strategies have significant effect on reading comprehension, and reported that the factors "Problem Solving Strategies" and "Supporting Reading Strategies" can significantly predict the cognitive levels in online forum discussions.

Finally, the results implied that different kinds of reading strategies were highly positively related. Data analysis indicates that the correlation coefficients between global reading strategies, problem-solving strategies and support reading strategies are over .70. It seems that they are acting as a whole to achieve students' reading comprehension, and they all can be helpful in students' reading process. However, because teachers do not provide sufficient explicit instruction of reading strategies in class, there is a strong need to teach reading strategies to enhance students' strategy awareness and reading comprehension (Baydik, 2011).

The major limitation of this research was that we only had six middle schools in the research. Although they were typical schools for the sampling, they still could not cover the diversity of Chinese middle schools. We did not select data from students in grade 9 and grade 12 in this research. Because there was severe competition on entrance exams for admission to grade 10 and to college in China, and because we would carry out teaching experiments in those schools in later studies, the middle schools in our research did not agree to support the research in those two grades. This may result in some biases in the data collection.

Further research work about the *MARSI-CN* includes measurement of students' metacognitive awareness of reading strategies, the relation between students' reading comprehension, reading motivation, and metacognitive awareness of reading strategies. Moreover, the relations between metacognitive awareness of reading strategies and other factors involved in metacognition in reading, such as learning style, reading attitude, and self-regulation are worthy of further research. Further research in metacognitive awareness of reading strategies will help to cultivate independent readers and to enhance students' reading skill.

In conclusion, the three-dimension construct of metacognitive awareness of reading strategies can be verified and fit the data from the adapted scale well. The results from the data analysis indicate that the translated and adapted instrument *MARSI-CN* has an effective reliability and validity. Therefore, it can be used in the research on students' metacognitive awareness of reading strategies in Chinese middle schools. It is a useful instrument in explicit instruction of reading strategies and in improving students' reading comprehension.

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