Investigating the Relationships between Chinese Test Takers' Cognitive and Metacognitive Strategy Use and Reading Test Performance

Limei Zhang

National Institute of Education,
Singapore Centre for Chinese Language,
Nanyang Technological University

Email: zhlimei2008@gmail.com

Abstract

Language assessment researchers have long perceived test-takers' strategy use as an important factor in test validation and test performance (Bachman, 1990; Cohen, 2006). Bachman and Palmer (2010) argued that language knowledge is managed by a set of strategies which determine how language is realized in actual language use. Messick (1989) pointed out that test takers are consistently different in their use of strategies. This study, therefore, was designed to investigate the relationships between test takers' cognitive and metacognitive strategy use and their ESL reading test performance.

616 Chinese college test takers responded to a 38-item Reading Test Strategy Use Questionnaire (ReTSUQ) (Zhang, Goh, & Kunnan, 2014) and a 50-item reading test. Three models of strategy use and reading test performance were hypothesized and tested. Results showed that test takers' cognitive and metacognitive strategy use function in synergy enhancing their reading test performance. In addition, college test takers' strategy use affected their lexico-grammatical reading ability (LEX-GR) significantly. Implications of the findings for pedagogical practice and test development are discussed.

Key Words: Chinese test takers; cognitive and metacognitive strategy use; reading test performance; structural equation modeling

Introduction

Studies show that ESL/EFL readers' metacognitive awareness is closely related to their reading performance (Carrell, 1989; Phakiti, 2008; Pressley & Afflerbach, 1995). The general consensus among researchers is that expert readers can control their reading processes by employing a repertoire of appropriate cognitive and metacognitive strategies. Similarly, due to its important role in enhancing test performance and validating tests, test takers' strategy use has attracted language testing researchers' attention (e.g., Cohen, 2013; Purpura, 1999; Phakiti, 2008; Zhang, 2014; Zhang & Zhang, 2013). This study was therefore designed to investigate the relationships between Chinese college test takers' cognitive and metacognitive strategy use on a widely used tertiary level EFL reading comprehension test in mainland China, the College English Test Band 4 (CET-4) Reading test.

Strategy use plays a highly important role in many activities regarding language use. Cognitive strategies refer to the ways test takers operationalize their reading skills (Cohen, 2013) whereas metacogntive strategies fall into the traditional categories of planning, monitoring and evaluating strategies (O'Malley & Chamot, 1990; Wenden, 1998). Researchers hold divergent views about the relationships between cognitive and metacogntive strategies (e.g., Paris, Waskik, & Turner, 1991; O'Malley & Chamot, 1990; Phakiti, 2008; Purpura, 1997). In the present study, three models were postulated to examine how cognitive strategies are related to metacognitive strategies.

The present study, therefore, addresses the following research questions:
1. What is the relationship between cognitive and metacognitive strategy use on the reading comprehension test?
2. What is the underlying structure of the EFL reading test performance as measured by the reading comprehension test?
3. What are the relationships between Chinese college test takers' strategy use and their reading test performance?

To answer the research questions, three models were hypothesized on the basis of the relevant literature: the unitary model, the higher-order model, and the correlated model. It was hypothesized that test takers' cognitive strategy use is correlated with their metacognitive strategy use and the two constructs have direct effects on students' test performance. Reading test performance was hypothesized to have two underlying factors: lexico-grammatical reading ability (LEX_GR) and text comprehension reading ability (TxtCOM).

Method

Participants

Six hundred and sixteen (616) Chinese college students were invited to participate in the study. There were 291 (47.9%) male and 317 (52.1 %) female students aged between 18 and 24 ($M = 19.38$; $SD = 1.05$).

Instruments

There are two instruments used in this study: the Reading Test Strategy Use Questionnaire (ReTSUQ) and the CET-4 Reading test.

The Reading Test Strategy Use Questionnaire (ReTSUQ)

The Reading Test Strategy Use Questionnaire (ReTSUQ) was developed as a measure of test takers' strategy use on reading tests (Zhang, Goh, & Kunnan, 2014; also see Zhang, Aryadoust, & Zhang, 2014). There are 38 items on the ReTSUQ measuring seven subscales. Metacognitive strategies consist of *planning, evaluating, monitoring* strategies; cognitive strategies comprise *general progression*, *identifying important information*, *inference-making*, and *integrating* strategies. The questionnaire used a six-point Likert scale: 0 (never), 1 (rarely), 2 (sometimes), 3 (often), 4 (usually), and 5 (always).

The CET-4 Reading Test

A retired version of the College English Test Band 4 (CET-4) Reading test was used to measure test takers' reading test performance (Fang, 2010). As a nationwide standardized test, the CET is administered by the National College English Testing Committee in collaboration with the Chinese Ministry of Education (Jin, 2008; Yang & Weir, 1998; Zheng & Cheng, 2008). The CET-4 Reading test used in this study comprises 50 items in four sections: Skimming and Scanning, Banked Cloze, In-Depth Reading, and Multiple Choice Cloze. Test takers were required to complete the reading test within 55 minutes.

Data Analysis

Preliminary statistical analyses

Descriptive statistics and reliability of the questionnaire and the reading test were calculated. Assumptions regarding univariate and multivariate normality were examined. Values of sknewness and kurtosis within ± 2 indicated univariate normality (Bachman, 2004). Multivariate normality was evaluated using Mardia's coefficient. A value of 5.00 or below showed multivariate normality (Byrne, 2006). In addition, reliability estimates of the ReTSUQ and the CET-4 Reading test were calculated.

Confirmatory factor analysis (CFA)

The CFA performed on the questionnaire data as Zhang, Goh, and Kunnan (2014) has provided sufficient theoretical support regarding the ReTSUQ. Overall, eight factors emerged from exploratory factor analyses (EFA) with the CET-4 Reading test in Zhang et al (2014): skimming items (SKM), scanning items (SKN), short-range constraints items (SR1 and SR2), long-range constraints items (LR1 and LR2), reading for implicit meaning items (REM), and reading for explicit meaning items (RIM). Thus, only CFA was conducted confirming the underlying structure of the reading test.

Structural equation modeling (SEM)

Language assessment researchers have adopted the SEM approach in a growing number of studies, especially in investigating learners' strategy use and test performance (Kunnan, 1998; In'nami & Koizumi, 2011). Three models of strategy use and reading test performance were tested: (a) a unitary model; (b) a higher-order model; and (c) a correlated model.

.

Results

Preliminary statistical analyses

Descriptive statistics of the questionnaire and reading test were calculated. All values of skewness and kurtosis were within the accepted range for the univariate normality. Due to the missing values, AMOS computer program cannot generate Mardia's coefficient. The reliability estimates for the questionnaire and the test is .89 and .83 (Cronbach's alpha), showing that they are reliable measuring instruments.

Confirmatory Factor Analysis (CFA)

According to the CFA analysis, the values of the fit indices showed that the two models fit the data well. The ratio of χ^2 to df is 2.71 and 2.95, which are less than 3.0; the incremental indices TLI and CFI are all greater than 0.90; the absolute indices RMSEA are .053 and .056, which are all less than .06, indicating good model fit. The RMSEA 90% confidence intervals are narrow.

Structural Equation Modelling (SEM)

The three hypothesized models were tested with the data. The unitary model fit the data best: CFI=.93, TLI = .90, RMSEA=.052 [90% confidence interval: .044, .060]. The ratio of χ^2 to df is 2.67. The value of AIC is the smallest among the three models. The unitary model appears to fit the data best statistically and substantively. Figure 1 presents the final SEM model with all standardized factor loadings.
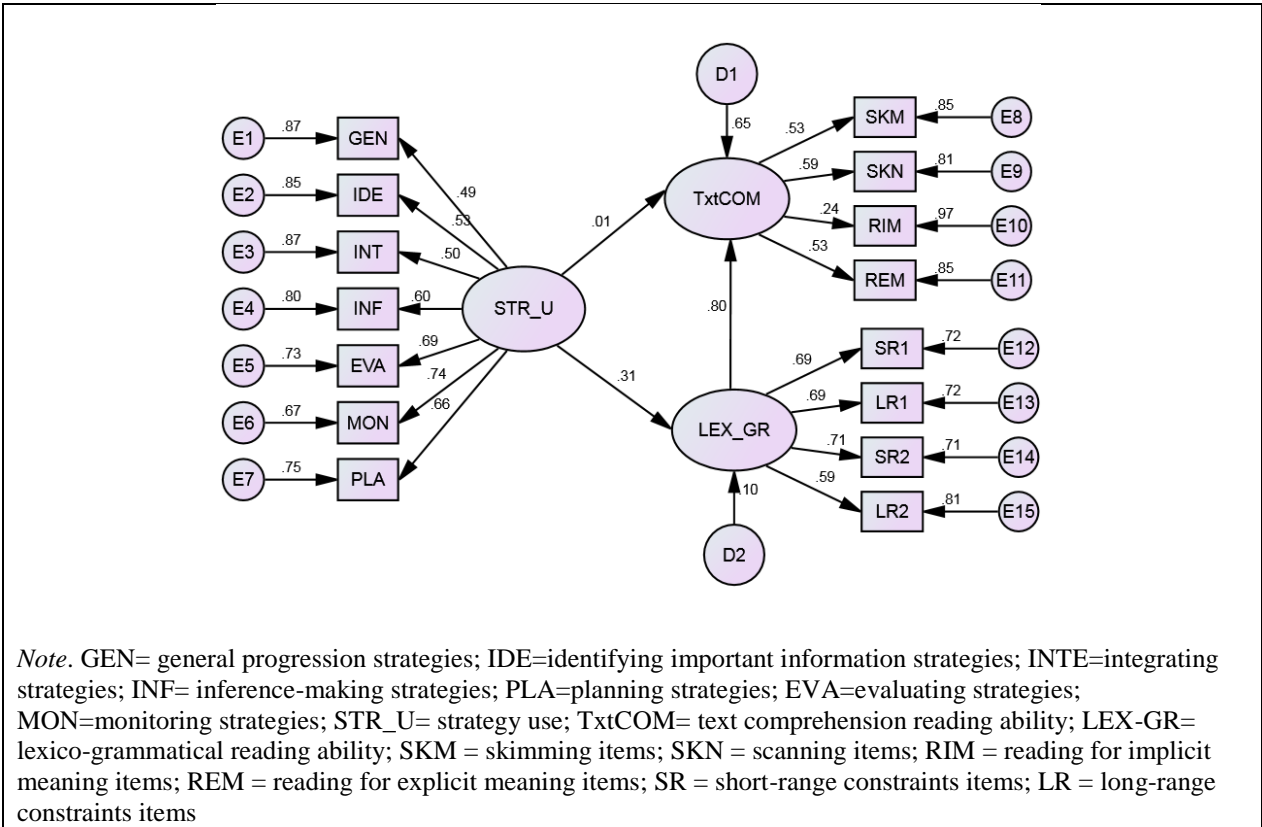
Note. GEN= general progression strategies; IDE=identifying important information strategies; INTE=integrating strategies; INF= inference-making strategies; PLA=planning strategies; EVA=evaluating strategies; MON=monitoring strategies; STR_U= strategy use; TxtCOM= text comprehension reading ability; LEX-GR= lexico-grammatical reading ability; SKM = skimming items; SKN = scanning items; RIM = reading for implicit meaning items; REM = reading for explicit meaning items; SR = short-range constraints items; LR = long-range constraints items

Figure 1. The final SEM model.

Discussion

This study examines the relationships between Chinese college test takers' strategy use and reading test performance using structural equation modeling approach (SEM). Results showed that the unitary model was a best fit among the three hypothesized models of strategy use and reading test performance. This section seeks to answer the research questions (RQs).

RQ1: What is the relationship between cognitive and metacognitive strategy use on the reading comprehension test?

SEM analysis showed that the unitary model was the best-fitting model among the three hypothesized models of strategy use and reading test performance. This indicates that cognitive and metacognitive strategies may function in synergy and enhance test takers' performance collectively in the test context. In other words, the finding provides empirical support for researchers' view that cognitive and metacognitive strategies are difficult to separate when language users are faced with a wide range of task demands (e.g., Baker, 1991; Chapelle et al., 1997; Paris et al., 1991).

RQ2: What is the underlying structure of the EFL reading test performance as measured by the reading comprehension test?

As showed in the analyses, the CET-4 Reading test had two underlying factors: lexico-grammatical reading ability (LEX-GR) and text comprehension reading ability (TxtCOM). LEX_GR was measured by short-range constraints items (SR) and long-range constraints items (LR) in Multiple Choice Cloze and Banked Cloze sections whereas TxtCOM was defined by skimming items (SKM), scanning items (SKN), reading for implicit meaning items (REM), and reading for explicit meaning items (RIM) in Skimming and Scanning and In-Depth Reading sections. The finding is consistent with an array of similar studies such as Phakiti (2008) and Purpura (1997) etc. In addition, LEX-GR had a direct and significant effect on TxtCOM (i.e., β=.80). This result is congruent with relevant reading theories (i.e., LaBerge & Samuels, 1974; Gough & Tunmer, 1986).

RQ3: What are the relationships between Chinese college test takers' strategy use and reading test performance?

Based on the final model identified (see Figure 1), test takers' strategy use (STR_U) was measured by seven types of strategies: planning (PLA), evaluating (EVA), monitoring (MON), general progression (GEN), identifying important information (IDE), inference-making (INF), and integrating (INT) strategies.

Additionally, it was found that test takers' strategy use affected their LEX-GR significantly ($\beta = .31$, $p < .05$) whereas it had an indirect effect on TxtCOM through LEX-GR. Several plausible reasons may explain this finding. First, Bachman and Palmer (2010) argued that strategy use is one part of test takers' characteristics among the factors that affect performance on language tests. The dominating factor is their language knowledge. Similarly, Phakiti (2008) also found that cognitive strategy use explained 16-30% of test takers' lexico-grammatical performance, suggesting that the limited variance accounted for by strategy use. This finding is also consistent with the findings from empirical studies that strategies may have positive, negative or no effects on language performance (e.g., Paris, 2002; Song, 2005).

Conclusions

This study investigates the relationships between Chinese college test takers' cognitive and metacognitive strategy use and their reading test performance. It was found that cognitive and metacognitive strategy use function in synergy enhancing test takers' performance on the test. In addition, strategy use was found to affect test takers' lexico-grammatical reading ability significantly but had an indirect effect on their text comprehension reading ability. Findings from this study suggest that instructions on strategy use may enhance test takers' reading performance but its function appears to be limited. To enhance students' test performance, instructors and learners should focus primarily on how to improve language proficiency *per se*.

References

Bachman, L.F. (1990). *Fundamental consideration in language testing*. Oxford, UK: Oxford University Press.

Bachman, L. F., & Palmer, A.S. (2010). *Language testing in practice*. Oxford, UK: Oxford University Press.

Baker, L., & Brown, A. L. (1984). Metacognitive skills and reading. In R. Barr, M.L. Kamil, P.Mosenthal, & P.D. Pearson (Eds.), *Handbook of reading research* (Vol.2, pp. 353-394). White Plains, NY: Longman.

Byrne, B. M. (2006). *Structural equation modeling with EQS: Basic concepts, applications, and programming* (2nd ed.). Mahwah, NJ: Lawrence Erlbaum Associates.

Carell, P. L. (1989). Metacognitive awareness and second language reading. *Modern Language Journal*, *73*(2), 121-131.

Chapelle, C., Grabe, W., & Berns, M. (1997). *Communicative language proficiency: Definitions and implications for TOEFL 2000. TOEFL Monograph Series No. 10*. Princeton, NJ: Educational Testing Service.

Cohen, A.D. (2006). The coming age of research on test-taking strategies. *Language Assessment Quarterly, 3*(4), 307-331.

Cohen, A. D. (2013). Using test-wiseness strategy research in task development. In A. J. Kunnan (Ed.), *The companion to language assessment* (pp.893-905). Hoboken, NJ: Wiley/ Blackwell.

Fang, Z. (2010). *Complete guide to the College English Test Band 4*. Beijing: Foreign Language Teaching and Research Press.

Gough, P. B. and Tunmer, W. (1986). Decoding, reading, and reading disability. *Remedial and Special Education*, *7*, 6-10.

In'nami, Y., & Koizumi, R. (2011). Factor structure of the revised TOEIC® test: A multiple-sample analysis. *Language Testing, 29* (1), 131-152.

Jin, Y. (2008). Powerful tests, powerfulness test designers? Changes facing the College English Test. *CELEA Journal, 31*, 3-11.

LaBerge, D. and Samuel, S. J. (1974). Toward a theory of automatic information processing. *Cognitive Psychology, 6*, 293-323.

Messick, S. (1989). Validity. In R. L. Linn (Ed.), *Educational measurement* (pp. 13-103). New York: Macmillan.

O'Malley, J. M., & Chamot, A. U. (1990). *Learning strategies in second language acquisition*. Cambridge: Cambridge University Press.

Paris, S. G. (2002). When is metacognition helpful, debilitating, or benign? In P. Chambres, M. Izaute, and P.Marescaux (Eds.), *Metacognition: Process, function, and use* (pp. 105-120). Norwell, MA: Kluwer.

Paris, S. G., & Jacobs, J. (1984). The benefits of informed instruction for children's reading awareness and comprehension skills. *Child Development*, *55*, 2083-2093.

Paris, S. G., & Winograd, P. (1990). How metacognition can promote academic learning and instruction. In B.F. Jones & L. Idol (Eds.), *Dimensions of thinking and cognitive instruction* (pp.15-51). Hillsdale, NJ: Erlbaum

Phakiti, A. (2008). Construct validation of Bachman and Palmer's (1996) strategic competence model over time in EFL reading tests. *Language Testing, 25*(2), 237-272.

Pressley, M., & Afflerbach, P. (1995). *Verbal protocols of reading: The nature of constructively responsive reading*. Hillsdale, NJ: Erlbaum.

Purpura, J. E. (1999). *Learner strategy use and performance on language tests: A structural equation modeling approach*. Cambridge, UK: Cambridge University Press.

Song, X. (2005). Language learner strategy use and English proficiency on the Michigan English Language Assessment Battery. *Spaan Fellow Working Papers in Second or Foreign Language Assessment, 3*, 1-23.

Wenden, A. L. (1998). Metacognitive knowledge and language learning. *Applied Linguistics, 19* (4), 515-537.

Yang, H. Z., & Weir, C. J. (1998). *Validation study of the National College English Test*. Shanghai: Shanghai Foreign Language Education Press.

Zhang, L-M. (2014). A structural equation modeling approach to investigating test takers' strategy use and their EFL reading test performance. *Asian EFL Journal.*

Zhang, L-M., Aryadoust, V., & Zhang, L. J. (2014). Development and validation of the Test Takers' Metacognitive Awareness Reading Questionnaire. *The Asia-Pacific Education Researcher, 23* (1)*, 37-51.*

Zhang, L-M., Goh, C., & Kunnan, A. (2014). Analysis of test takers' metacognitive and cognitive strategy use and EFL reading test performance: A multi-sample SEM approach. *Language Assessment Quarterly, 11*(1), 76-102*.*

Zhang, L-M., & Zhang. L .J. (2013). Relationships between Chinese college test takers' strategy use and EFL reading test performance: A structural equation modeling approach, *RELC Journal,* 44 *(1), 35-57.*

Zheng, Y., & Cheng, L. (2008). Test review: College English Test (CET) in China. *Language Testing, 25*(3) 408-417.