Arab World English Journal
INTERNATIONAL PEER REVIEWED JOURNAL ISSN: 2229-9327
مجلة اللغة الانكليزية في العالم العربي

AWEJ Volume.5 Number.4, 2014

Pp.187-202

Metacognitive and Cognitive Strategy Use and Performance on a Reading Test with Multiple-format Tasks

Mohammed Assiri
English Language Center
Institute of Public Administration, Saudi Arabia

Abstract

Metacognitive and cognitive strategies collaborate in the actual taking of reading tests (Phakiti & Li, 2011). In certain EFL contexts, it was found that metacognitive strategies regulated cognitive strategies that directly affected test performance. However, a question can be posed as to whether this finding applies to other EFL contexts, for example, Saudi Arabia. Besides, effects of metacognitive and cognitive strategies on performances on different reading-task formats remain unexplored. Therefore, this study examined effects of metacognitive and cognitive strategies on performance on a reading test composed of four task formats, among 98 Saudi EFL learners. Data comprised scores on a reading test and responses to a strategy questionnaire. Findings showed that cognitive strategy use mediated the effect of metacognitive strategy use on test performance. The use of both metacognitive and cognitive strategies had small to medium effects on performances on the task formats. Most strategy subscales were directly related to performances on the task formats. It was concluded that Saudi EFL learners make use of metacognitive and cognitive strategies on reading tests in a manner similar to that observed in other EFL contexts. Also, different reading tasks demand versatile uses of metacognitive and cognitive strategies. This study ends with implications for strategy instruction and reading assessment, the current theory, and future research.

Keywords: Cognitive strategies, metacognitive strategies, reading tests, task format, test performance.

Introduction

Recent research on L2 reading (see Alderson, 2000; Anderson, 2005; Hudson, 2007) has shown that successful performance on reading tasks involved appropriate use of skills and regulation of strategies. On the basis of the information-processing theory (Newell & Simon, 1972), scholars (e.g., Phakiti, 2008; Purpura, 1999) uphold the view that strategies used in reading tests can be categorized as metacognitive strategies and cognitive strategies. While the former refer to a set of conscious tactics that regulate cognitive processing of linguistic input through planning beforehand, monitoring comprehension, and evaluating performance, the latter represent conscious behaviors that help with understanding, storing, and recalling of linguistic information. In other words, metacognitive strategies comprise planning, monitoring, and evaluation, whereas cognitive strategies encompass comprehension, memory, and retrieval.

There have been recent calls for more research on how strategic competence shapes performance on language tests (e.g., Phakiti, 2008). One area of strategic competence, in need for more research, deals with how the use of metacognitive and cognitive strategies influences performance on reading tests. In this respect, Phakiti (2006) notes that the use of such strategies on reading tasks can be described as "a synchronic situation-related variation between metacognitive strategies and cognitive strategies" (p. 83). This suggests that the ways in which metacognitive and cognitive strategies are used on reading tests are determined by situational factors, including task formats. However, it remains unexplored as to how metacognitive and cognitive strategy use relates to performance on a reading test composed of multiple-task formats.

Performance on language tests, including tests of reading, highly varies among learning settings depending on a multitude of context-specific factors (McNamara, 1996). Research on how metacognitive and cognitive strategies are used on reading tests in a variety of EFL settings would allow us to compare relevant findings across these settings (Phakiti, 2008). From my experience as an EFL instructor in Saudi Arabia, there is almost a lack of emphasis on the role of strategic awareness among learners in intensive English programs. Learners believe that they have to rely only on their knowledge of English to do well on their exams. And, if they are confronted with challenging questions, they try to make maximum use of test-wiseness. This would ultimately reduce any chances of positive effects of assessment on learning (or positive washback). Therefore, it is hoped that this study would draw the attention of EFL practitioners in Saudi Arabia to the importance of implementing strategy instruction, especially for purposes that serve reading assessment.

Literature Review

Research on how metacognitive and cognitive strategy use relates to performance on reading tests first started in the late 1990s. In one of the earlier studies, Purpura (1998) investigated the relationship between strategy use and performance on a standardized test. The researcher had 1,382 EFL respondents from language centers in three European countries. The respondents first filled out a metacognitive and cognitive strategy questionnaire. Then, they took a test composed of two main sections on reading comprehension and English usage. Using structural equation modeling, the researcher found two factorial structures: One factor represented metacognitive strategy use which consisted of planning, monitoring, and evaluation strategies; and, another represented cognitive strategy use which comprised comprehension, memory, and retrieval strategies. Based on this model, the researcher concluded that use of metacognitive strategies had a significantly direct, positive effect on the use of cognitive strategies.

In a different setting, Phakiti (2003) had 384 Thai EFL students at the university level take a reading achievement test in a multiple-choice format. Then, the respondents reported their strategy use by answering a metacognitive-cognitive strategy questionnaire. On the basis of both quantitative and qualitative data analyses, the researcher found that the use of both metacognitive and cognitive strategies influenced the overall test performance in a positive way. However, Phakiti (2003) did not describe the relationships between strategy variables and performance variables, for example, how the use of planning strategies related to test performance, given that the test was administered in a multiple-choice format.

In another study, Phakiti (2006) had a sample of 358 Thai EFL learners take a reading test and immediately fill out a strategy questionnaire. Using structural equation modeling, the researcher found that test takers' use of comprehension strategies was largely enhanced by their use of memory and retrieval strategies, and that test takers regulated their use of memory strategies through monitoring strategies. He also found that test takers used evaluation strategies to coordinate their use of retrieval strategies, and that monitoring and evaluation strategies mediated the effect of planning strategies on cognitive strategies.

Drawing on previous research on the use of metacognitive and cognitive strategies on reading tests, Phakiti (2008) attempted to validate Bachman and Palmer's (1996) model of strategic competence. The researcher had a sample of 561 Thai EFL learners report their strategy use after completing two achievement exams. Each of the exams was a multiple-choice format, composed of gap-filling and comprehension tasks. Using structural equation modeling, the researcher found that metacognitive strategy use executed cognitive strategy use, which had a positive effect on test performance. The researcher concluded that his findings validated Bachman and Palmer's (1996) model, which suggests that test performance is influenced by strategy use.

In general, the previous findings suggest that metacognitive strategies regulated cognitive strategies that in turn influenced reading test performance. However, it is not yet evident whether these findings also apply to EFL learners in other contexts, like Saudi Arabia. Besides, the previous studies focused on the extent to which metacognitive and cognitive strategies relate to performance on reading tests in general. That is, no attempts have been made yet to link between strategy use and performances on reading tasks that have different formats. Hence, with a sample of Saudi EFL learners, the current study aimed to investigate how metacognitive and cognitive strategy use relates to performance on a reading test as a whole and multiple-format tasks that make up the test.

Research questions

The research questions the current study attempted to answer are as follows:

1. How does each of metacognitive strategy use and cognitive strategy use relate to overall performance on a reading test?
2. How do metacognitive and cognitive strategies relate to performances on true/false, multiple-choice, fill-in vocabulary, and constructed-response task formats?

Method

The method followed in this research can be described as follows.

Setting and participants

The research took place in an intensive English program that is part of a governmental institute in Saudi Arabia. The participants were 98 male students, aged from 19 to 24. They were at the

elementary or second level of the program. Students at this level are expected to have attained a command of English that accords with the American Council on the Teaching of Foreign Languages (ACTFL) proficiency guidelines (2012) for reading at the Intermediate Mid level. That is, on average, participants were "able to understand short, non-complex texts that convey basic information and deal with basic personal and social topics to which the reader brings personal interest or knowledge, although some misunderstandings may occur" (p. 23). At the time data for this study were collected, the participants were almost finished with level two.

Instruments

Two instruments, a strategy questionnaire and a reading test, were used. The questionnaire consists of metacognitive and cognitive strategy scales and their subscales (Phakiti, 2008) (see Appendix for the English version). The questionnaire was validated in previous research through piloting it with populations of EFL learners (see Phakiti, 2008). The questionnaire was translated into Arabic, and the translation was cross-checked with the English version by two Arabic native speakers who held MA in TESL. Suggestions for changes or improvements were made by the researcher. Table 1 displays a distribution of metacognitive and cognitive strategy scales and their subscales in the questionnaire.

Table 1. ***Distribution of metacognitive and cognitive strategies in the questionnaire***

Scales	Subscales	No. of items	Items
Metacognitive	Planning	6	1, 2, 3, 4, 5, 6
	Monitoring	5	7, 8, 9, 10, 11
	Evaluation	6	12, 13, 14, 15, 16, 17
	Subtotal	17	
Cognitive	Comprehension	4	18, 19, 20, 21
	Memory	4	22, 23, 24, 25
	Retrieval	5	26, 27, 28, 29, 30
	Subtotal	13	
	Total	30	

The reading test was part of the formative assessment of students' achievement of reading skills. It was specifically on a topic related to food and nutrition which constitutes a whole unit in students' textbook. However, the text selected for the test was not familiar to students in order to have them apply the reading skills they developed during the course. The test consisted of four task types. The first task comprised true or false statements that measured students' ability to judge the truth of a given statement. The second task included multiple-choice items which required students to select the option that represents the best answer to a given question. The third task consisted of fill-in vocabulary items which prompted students to select a word, from a group of words, that best fits the context of a given sentence. The fourth

task contained constructed-response items that called for the provision of short, open-ended answers to information questions. Each of the four tasks had five items on the test.

Data collection

At the time of the test, it was brought to students' attention that they should complete the questionnaire—attached to the test—once they are finished with the test. To motivate students to complete the questionnaire, they were told that they would be rewarded two extra points in their total grades for the subject. Students were allowed forty minutes to complete the test. Strategy data were collected immediately after the test to ensure the elicitation of data specific to the test. The researcher, the instructor of the subject, was available all the time to guide students through these procedures and answer any questions.

Data analysis

To prepare data for analysis, composites for strategy scales and subscales were produced by adding up scores on relevant strategy items on the questionnaire and dividing the totals by the total number of relevant strategy items. This method controls for error effects that are due to a participant's random selection of responses (Schmidt & Hunter, 1999). Each of the task types on the reading test was scored out of five; and so, the total score on the test added up to 20. The scores were used to symbolize the overall test performance as well as individual performances on the four task types.

Table 2. ***Descriptive statistics of strategy and performance variables***

	N	Minimum	Maximum	Mean	SD	Skewness	Kurtosis
MetStrs	98	2.14	5.00	3.60	0.65	-0.38	-0.11
PlanStrs	98	2.00	5.00	3.81	0.75	-0.53	-0.26
MonStrs	98	1.40	5.00	3.24	0.91	-0.23	-0.68
EvaStrs	98	2.00	5.00	3.77	0.76	-0.37	-0.77
CogStrs	98	2.18	4.68	3.72	0.59	-0.45	-0.33
ComStrs	98	1.25	5.00	3.91	0.84	-1.04	0.94
MemStrs	98	2.00	4.75	3.47	0.71	-0.15	-0.57
RetStrs	98	2.20	5.00	3.79	0.69	-0.11	-0.92
Total Score	98	6.00	19.00	13.55	3.09	-0.56	-0.28
TF	98	0.00	5.00	3.65	1.14	-1.03	0.95
MC	95	1.00	5.00	3.73	0.95	-0.56	-0.20
FV	98	0.00	5.00	4.05	1.50	-1.32	0.54
CR	98	0.00	5.00	2.23	1.18	0.22	-0.31
Valid N (listwise)	95						

Note. MetStrs=metacognitive strategies; PlanStrs=planning strategies; MonStrs=monitoring strategies; EvaStrs=evaluation strategies; CogStrs=cognitive strategies; ComStrs=comprehension strategies; MemStrs=memory strategies; RetStrs=retrieval strategies; Total Score=the total score; TF=true/false; MC=multiple-choice; FV=fill-in vocabulary; CR=constructed response

Table 2 shows descriptive statistics of metacognitive and cognitive strategy subscales, and performances on the reading test and its four tasks. Since the values of skewness are within

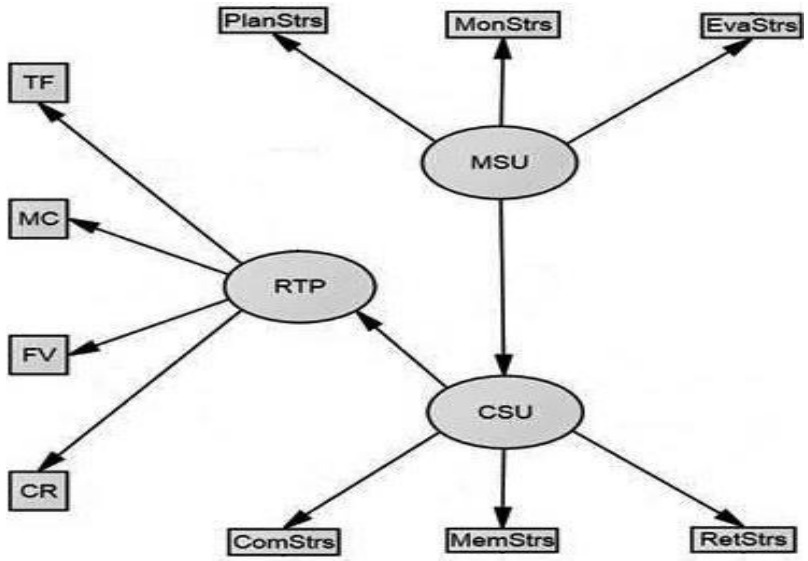
(-2 and +2) and kurtosis are almost near zero, the strategy and performance variables can be said to be normally distributed (Rubin, 2010). This indicated to the researcher that the number of participants was adequate for advanced statistical analyses. The questionnaire had a coefficient alpha of 0.832, which suggests that this instrument was highly consistent in measuring strategy use across its items. As validity and reliability checks of the reading test, the participants' scores on the test were correlated with their scores on another reading test at the same level. The correlation was substantially positive: r (96) = 0.492, p<.01.

In order to determine the extent to which strategy and performance variables can be linked to each another, two analytical procedures were employed. First, structural equation modeling (henceforth SEM) was used to confirm that hypothesized relationships between metacognitive strategy use, cognitive strategy use, and reading test performance would apply to the data (see Schreiber, Stage, King, Nora, & Barlow, 2006). In statistical terms, SEM serves to either explore or confirm relationships among a set of factors (underlying variables), and between these factors and their indicators (observed variables). SEM is an analysis that combines multiple regression, factor analysis, and path analysis. Multiple regression provides estimates of directional relationships among variables. Factor analysis determines a common, underlying factor for a set of observed variables. And, path analysis tests the fit of the overall SEM model. According to Phakiti (2008), SEM is useful in strategy research because it controls for measurement error in data analysis, which maximizes generalizability of research findings. Second, multiple linear regressions were used to regress scores on the four task formats on the use of each of the metacognitive and cognitive strategy subscales. Linear regression measures the strength of predicting an outcome variable from one or more predictor variables. The analytical procedures were performed using SPSS Amos 19 (IBM, 2011a) for SEM, and SPSS Statistics 19 (IBM, 2011b) for regression analyses.

Results and discussion

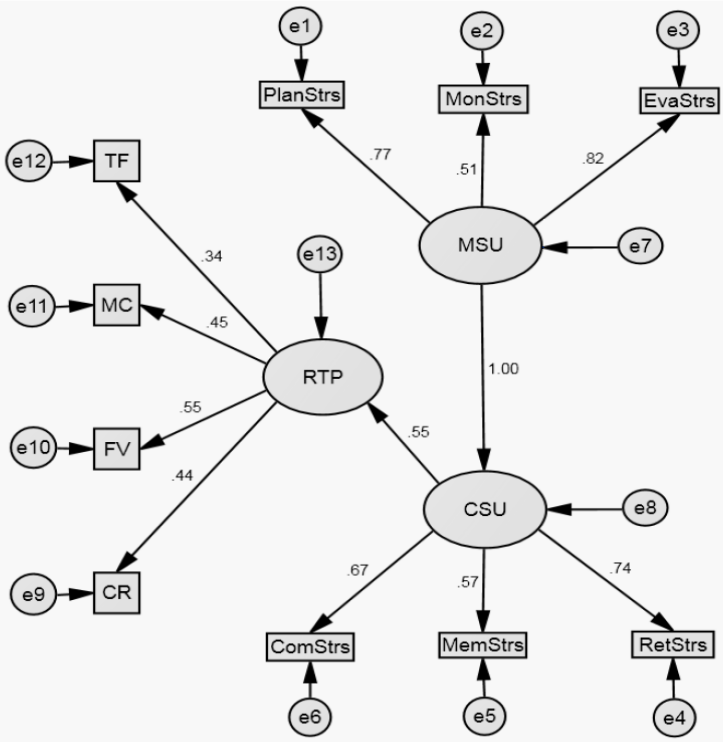
The answer to the first research question called for confirming whether the hypothesized relationships that join metacognitive strategy use (MSU) and cognitive strategy use (CSU) and reading test performance (RTP) on the reading test actually existed.

Figure 1. ***A hypothesized model of the relationships between MSU, CSU, and RTP.***



A hypothesized model of the relationships among MSU and CSU and RTP (see Figure 1 above) was based on the previous studies (Phakiti, 2003/2008; Purpura, 1998). In this model, MSU executes CSU that in turn influences RTP. Also, MSU represents the common, underlying factor of planning strategies (PlanStrs), monitoring strategies (MonStrs), and evaluation strategies (EvaStrs). CSU represents the factor of comprehension strategies (ComStrs), memory strategies (MemStrs), and retrieval strategies (RetStrs). And, RTP is the factor of performances on the four task formats: true/false (TF), multiple choice (MC), fill-in vocabulary (FV), and constructed response (CR). The arrows that link MSU, CSU, and RTP indicate the directions of effects, whereas the other arrows connect factors to their respective indicators.

Figure 2. ***A SEM model of the relationships between MSU, CSU, and RTP in this study.***



SEM was used to model the relationships between strategy scales and test performance. The SEM model was respecified and retested several times in order to reach a model with a good statistical fit. The result was that the model did not depart significantly from the data (Chi-square ($x^2_{(33)}$) = 39.613, p =.199). The Chi-square estimate here needs not be significant in order for the SEM model to be fit (Byrne, 1994). Figure 2 above shows the SEM model of the relationships between MSU, CSU, and RTP using the actual data in this study. The structures of MSU and CSU are no different from those reported in previous research (e.g., Phakiti, 2008). Besides the variables that appear in the hypothesized model (Figure 1 above), the model in Figure 2 shows estimates and directions of regression weights (effects) among MSU, CSU, and RTP, and estimates and directions of loadings in factorial structures of the three variables. Random errors of measurement in the model are indicated by (e) followed by serial numbers. Standardized effects are reported here because they reflect the strength of the effect of each predictor on an outcome in comparison to those effects of other predictors on the same outcome (Shultz &

Whitney, 2005). Kline (2011) categorizes four magnitude levels of standardized effects as follows: nil for .00-.09, small for .10-.29, medium for .30-.49, and large for estimates equivalent to .50 or larger. All effects in the model in Figure 2 have levels of significance ranging from .05 to .01.

Table 3 displays standardized direct, indirect, and total effects of MSU, CSU, and RTP on strategy subscales and performances on task formats. Total effects are sums of direct and indirect effects. Indirect (or mediated) effects are effects of a predictor on an outcome through a mediating variable. More than half of the total effects were large (i.e., >.5), and there was roughly an equal number of medium and small total effects. Because the total effects incorporated both direct and indirect effects, they are more illustrative of how sizeable the overall effects among strategy and performance variables were. Nine out of the twelve direct effects were large, and the rest were medium. Also, six out of the twelve indirect effects are medium to large. These results indicate the strongly regressive relationships between strategy and performance variables. At the level of the factorial structures, MSU and CSU accounted for a large amount of variance in their respective strategy subscales. Also, RTP accounted for a medium to large amount of variance in the performances on the four task formats (TF, MC, FV, and CR). MSU had a large direct effect on CSU which, in turn, had a large direct effect on RTP. MSU also had a large indirect effect on RTP, through the mediation of CSU. Each of MSU and CSU had a medium indirect effect on the performance on FV task items, and small indirect effects on the performance on the other task formats (i.e., TF, MC, and CR).

Table 3. ***Standardized total, direct, and indirect effects in the SEM model***

Variables	Total effects			Direct effects			Indirect effects		
	MSU	CSU	RTP	MSU	CSU	RTP	MSU	CSU	RTP
MSU	.000	.000	.000	.000	.000	.000	.000	.000	.000
PlanStrs	.772	.000	.000	.772	.000	.000	.000	.000	.000
MonStrs	.507	.000	.000	.507	.000	.000	.000	.000	.000
EvaStrs	.823	.000	.000	.823	.000	.000	.000	.000	.000
CSU	1.003	.000	.000	1.003	.000	.000	.000	.000	.000
ComStrs	.676	.674	.000	.000	.674	.000	.676	.000	.000
MemStrs	.572	.570	.000	.000	.570	.000	.572	.000	.000
RetStrs	.741	.739	.000	.000	.739	.000	.741	.000	.000
RTP	.551	.549	.000	.000	.549	.000	.551	.000	.000
TF	.186	.186	.339	.000	.000	.339	.186	.186	.000
MC	.246	.245	.447	.000	.000	.447	.246	.245	.000
FV	.300	.300	.545	.000	.000	.545	.300	.300	.000
CR	.241	.240	.437	.000	.000	.437	.241	.240	.000

Note. Degrees of shading reflect magnitude levels: ■=large; ■=medium; ■=small; □=nil.

Generally, the SEM results confirmed the hypothesized relationships among metacognitive strategies, cognitive strategies, and reading test performance. Students used their metacognitive strategies to regulate their cognitive strategies, which influenced their test performance. Metacognitive strategy use was structured of three strategy subscales that comprised planning, monitoring, and evaluation. In other words, test takers controlled their test performance by means of strategies they used to plan how to answer the test, how to monitor their response behaviors, and how to evaluate their test taking. Also, cognitive strategy use was the factor underlying the three cognitive strategies of comprehension, memory, and retrieval. Thus, while using their cognitive strategies, test takers were processing textual information using their comprehension, memory, and retrieval strategies. The overall reading test performance, on the other hand, was composed of individual performances on the task formats (true/false, multiple choice, fill-in vocabulary, and constructed response) that make up the test.

Metacognitive strategy use exercised a regulatory function over the use of strategies that reflected the cognitive processes of comprehension, memory, and retrieval. Thus, similar to the findings of Phakiti (2008) and Purpura (1998), metacognitive strategy use is strongly, directly related to cognitive strategy use. Cognitive strategy use, on the other hand, mediated the effect of metacognitive strategy use on reading test performance. In fact, the size of the indirect effect of metacognitive strategy use on reading test performance was almost equivalent to the size of the direct effect of cognitive strategy use on reading test performance. This indicates that metacognitive strategies were necessary to execute comprehension, memory, and retrieval processes through cognitive strategies. As Phakiti and Li (2011) suggest, this fact reflects a form of collaboration between metacognitive and cognitive strategies in the attainment of goals of language use. Purpura (1999) also reached the same conclusion when noting that the use of both metacognitive and cognitive strategies is important to achieving high levels of performance on reading tests.

In addition, cognitive strategy use was strongly associated with the performance on the reading test. By extension, cognitive strategies for comprehension, memory, and retrieval accounted for performances on the four task formats including true/false, multiple choice, fill-in vocabulary, and constructed response. Though indirect, the magnitude of the effect of metacognitive strategy use on reading test performance was greater than that of cognitive strategies on reading test performance. Nevertheless, the effects of metacognitive and cognitive strategy use on performances on the four task formats were small to medium in size. This agrees with the previous findings of Phakiti (2008) and Purpura (1998) in that strategy use on certain reading tasks did not contribute to test performance significantly.

The second research question examined the extent to which the use of metacognitive and cognitive strategies could predict performances on the task formats (i.e., TF, MC, FV, and CR respectively) that made up the reading test. Results of regression analyses were used to answer this question, as shown in Table 4 below. Results of all ANOVA tests indicated that all regression models significantly predicted performances on task formats on the basis of strategy subscales (see Table 5). Each one of the three metacognitive subscales (planning, monitoring, and evaluation) predicted performance on a certain task format (CR, TF, and MC respectively). As for the three cognitive subscales, only memory and retrieval strategies significantly predicted performance on certain task formats. That is, while memory strategies predicted performance on two task formats: MC and FV, retrieval strategies predicted performance on all four task formats.

Table 4. ***Regressions of task performances on strategy subscales***

Strategies	Tasks	TF		MC		FV		CR	
		β	*p*	β	*p*	β	*p*	β	*p*
MSU	PlanStrs	.253	.238	.158	.370	.421	.062	.762	.007*
	MonStrs	.318	.024*	.098	.384	.128	.378	.221	.219
	EvaStrs	.381	.078	.715	.000*	.397	.078	-.073	.792
CSU	ComStrs	-.058	.760	.184	.232	-.174	.395	.066	.807
	MemStrs	.307	.069	.284	.037*	.379	.037*	.150	.529
	RetStrs	.703	.001*	.505	.002*	.738	.001*	.679	.018*

Note. MSU=metacognitive strategy use; CSU=cognitive strategy use; TF=true/false; MC=multiple choice; FV=fill-in vocabulary; CR=constructed response; β=regression coefficient; *p*=significance level; asterisk * indicates significance within .00 to .05.

Table 5. ***Results of ANOVA tests of regression models***

Strategies \ Tasks	TF	MC	FV	CR
	F(3, 95)	*F*(3, 92)	*F*(3, 95)	*F*(3, 95)
MSU	260.139	432.163	236.621	143.626
CSU	282.948	445.410	241.367	122.895

Note. All *F* values are significant at .000.

In regard to metacognitive subscales, planning strategies enabled test takers to perform well on constructed-response items. Thus, planning how to respond to the reading test helped test takers perform well on this task which called for writing answers to comprehension questions. It is possible that test takers read these items before they read the text, which allowed them to attend to the information required to answer these items while reading the text. Monitoring strategies caused test takers to score high on true/false items. Perhaps, because rushing to mark either a true or false answer would be risky since test takers thought of these items as profitable. Evaluation strategies were especially effective with multiple-choice items. While answering these items, test takers were obviously engaged in an evaluative process to decide which option to choose. As was the case with true/false items, test takers did not want to risk choosing just any

answer on a multiple-choice item because of the high possibility of scoring higher on these items.

As for cognitive subscales, memory strategies were associated with high performance on multiple-choice and fill-in vocabulary items. It seems that because these task items represent selected-response formats, test takers employed tactics that drew on memory. Therefore, test takers found it useful to link the content of these items to what they had in mind as a result of reading the text and/or going through the previous task items. Interestingly, retrieval strategies were used on all four task formats. This indicates that test takers used their understanding of the questions to recall relevant information according to the text and/or their background knowledge. In contrast to the other strategies, comprehension strategies did not have any significant correlations with performance on any of the four task formats. This suggests that test takers did not make sufficient use of comprehension of textual information in their answers to the four tasks.

Therefore, with the exception of comprehension strategies, each strategy subscale was directly related to the purpose of a certain task format. For example, when test takers needed to decide about a true/false item, they had to exercise monitoring of their dealing with this format. Optimum performance on constructed-response items required the use of planning strategies in order to attend to the required information in the text before the provision of the answer. Evaluation strategies were necessary in order to judge the options on the multiple-choice task. Memory strategies were especially helpful in answering multiple-choice and fill-in vocabulary items. Test takers made heavy use of retrieval strategies in their response to the four task formats. The main reason for this was probably because test takers could retrieve relevant information from their reading of the text as well as background knowledge in their answers to all task formats.

Conclusions

Based on the findings of this study, metacognitive strategy use regulates the use of cognitive strategies that reflect reading processes of comprehension, memory, and retrieval. And, cognitive strategy use directly affects reading test performance. Consequently, the level of reading test performance is determined by the extent to which metacognitive and cognitive strategies are used systematically. Nevertheless, the effects of metacognitive and cognitive strategy use on performances on reading tasks with different formats are expected to range from small to medium in size. This can be linked to the role of other factors such as test-taker characteristics, level of working memory, task difficulty, and others (Phakiti, 2008; Purpura, 1998).

Like their counterparts in previous research, Saudi EFL learners use metacognitive strategies to execute cognitive strategies in a manner that influences performance on reading tests. To be precise, planning strategies help test takers think about how to actually respond to the questions on the test. Monitoring strategies involve control of response behaviors by which a test taker can take any necessary steps to provide the best answer. Evaluation strategies aid test takers' attempts to determine the right answer on selected-response formats. Evaluating each choice in terms of its relevance to either the required information, the topic of the text or subject matter, or the content of the question itself can help better decide on the best answer. As for cognitive strategies, memory strategies help with selected-response formats because test takers can use memory associations of pieces of information to determine the right choice. Through retrieval strategies test takers can relate the content of the questions to the information they learned from the text or their background knowledge. This aspect makes retrieval strategies

usable with a variety of task formats. Comprehension strategies, however, are likely to be the least used among cognitive strategies at a beginner's level. Accordingly, test takers at this level tend to use compensatory strategies, like use of memory associations and retrieval of similar forms, to make up for any deficiencies in comprehension skills.

The most important contribution of this study to the current research lies in demonstrating how metacognitive and cognitive strategy use relates to performance on different formats of reading-testing tasks. Generally, the use of metacognitive and cognitive strategies when responding to multiple formats of reading tasks is positively correlated with test performance. For example, planning strategies help the test taker manage his use of comprehension, memory, and retrieval abilities in response to constructed-response questions. Monitoring strategies aid performance on tasks that require judgment such as true/false questions. Evaluation strategies boost performance on selected-format tasks such as multiple-choice questions. As regards cognitive strategies, memory strategies facilitate response to selected formats, including multiple-choice and fill-in vocabulary questions. And, retrieval strategies are in demand with all task formats. Therefore, skillful use of metacognitive and cognitive strategies on reading tests involves matching these strategies with task formats.

Implications for practice and research

This research has important implications for practice in the fields of language learning and testing. First, offering learners enough training in the use of metacognitive and cognitive strategies on reading tasks is essential if they are to perform well on these tasks. In particular, recent research on efficacy of strategy instruction (e.g., Akkakoson & Setobol, 2009; Erskine, 2010; Wichadee, 2011) has pointed out significant positive effects that instruction of metacognitive and cognitive strategies can have on performance on reading tasks. Besides, if learners receive enough training in metacognitive strategy use on reading tasks, they are likely to benefit from it in their use of cognitive strategies. Cognitive strategies are manifests of reading processes that may not be executed well in the absence of metacognitive strategies.

Strategy instruction is especially encouraged with readers whose comprehension skills are low compared to the majority at the same level of language learning. Alderson (2000) argues that poor readers can be trained in how to make use of metacognitive and cognitive strategies, which can boost their reading performance and test scores. For the most part, strategy instruction should present learners with descriptions and exemplifications of what metacognitive and cognitive strategies are and how they are used. Moreover, Zhang and Seepho (2013) recommend that learners be made aware of the range of potential strategies they can use on a given test, especially metacognitive strategies. Training in strategy use demands ample time and tremendous effort on the part of both teachers and learners (Wichadee, 2011). Therefore, strategy instruction needs to be planned for well in advance and never abandoned, because its potential outcomes can serve both short- and long-term goals of developing reading skills.

The findings of the current study have practical suggestions for teachers on how to implement strategy instruction of metacognitive and cognitive strategies. First, teachers are advised to introduce to their students the two notions of metacognitive and cognitive strategies in a simple, yet practical manner. Thus, the teacher may inform students that metacognitive strategies mean a learner's thinking about how to respond to a reading test, how to track and check his progress during the test-taking, and how to determine the quality of her responses to the test questions. Then, the teacher brings about the link between how these thinking processes affect a learner's actual test-taking by regulating cognitive strategies or more specifically the

way a learner understands textual information, stores the information in his memory, and retrieves the information when needed.

In a testing setting, the test taker is engaged in active and quick thinking about what to do, and may experience uncertainty about which strategy to use. However, strategy training and practice using a variety of reading-testing formats can help the learner automatize strategy use, and so when responding to a given task format, he can perform faster and even better. When designing assessments of reading, teachers are advised to employ a variety of task formats. Such task formats may include true/false, multiple-choice, fill-in vocabulary, and constructed-response items. This would certainly motivate students to make full use of their metacognitive and cognitive strategies. At the same time, it would offer students an ample opportunity to practice the strategies they have learned through strategy instruction.

The current study offers insightful findings in regard to how metacognitive and cognitive strategy use interacts with task formats, and how such an interaction influences performances on the overall test and the individual tasks. These findings are significant contributions to the current theory and research on metacognitive and cognitive strategy use on reading tests. The current theory should be formulated in a manner that accommodates EFL learners in various contexts. The fact that learners use their metacognitive strategies to regulate their cognitive strategies in a manner that serves their reading test performance appears to be applicable to all EFL contexts. The current theory should also take into account how strategy use interacts with task format, and how this interaction influences test performance. Strategy use is unlikely to influence test performance in isolation of any effects from task formats. It is now evident from this study that different task formats demand flexible and versatile use of metacognitive and cognitive strategies. Thus, the manner in which these strategies are used can aid the response to a given task format.

More research that studies how metacognitive and cognitive strategy use relates to performance on multiple-format reading tasks is recommended. Such research may help both confirm the findings of the current study and allow for comparisons of findings from different learning contexts. For the sake of conducting comparative studies, future research may consider the use of the metacognitive and cognitive strategy questionnaire as well as SEM, as did the current study. Regression analyses can then be used to examine the extent to which performance variables can be predicted on the basis of strategy variables. It is also advisable that future research be focused on metacognitive and cognitive strategy use on tests of other language skills, including listening and writing. Future research can also make use of online-report or introspective measures, including the approach (Assiri, 2011) which combines stimulated recall, self-observation, and retrospective interview.

Acknowledgements

I am so grateful to my colleagues, Jarrallah Alghizzi and Raed Alsakran, for their reviews and comments on the Arabic translation of the strategy questionnaire. I am thankful to all of the students who participated in this research.

About the Author:

Dr. Mohammed Assiri is an EFL instructor at the English Language Center, Institute of Public Administration, Saudi Arabia. He received his B.A. in the English Language at King Khalid

University, M.A. in TESL at the University of Kansas, and Ph.D. in English at Oklahoma State University. His main research interests are in the areas of EFL testing and CALL.

References

ACTFL. (2012). *ACTFL proficiency guidelines for reading*. Retrieved April 17, 2012 from http://actflproficiencyguidelines2012.org/reading

Akkakoson, S., & Setobol, B. (2009). Thai EFL students' use of strategies in reading English texts. *The Journal of KMUTNB, 19*(3), 329-342.

Alderson, R. (2000). Research foundations to support wide reading. In V. Greaney (Ed.), *Promoting reading in developing countries* (pp. 55-77). Newark, DE: International Reading Association.

Anderson, N. (2005). L2 learning strategies. In E. Hinkel (Ed.), *Handbook of research in second language teaching and learning* (pp. 757-772). Mahwah, NJ: Lawrence Erlbaum Associates.

Assiri, M. (2011). *Test-taking strategy use on the reading section of the TOEFL iBT: A study of Arab ESL learners* (Doctoral dissertation). Available from ProQuest dissertation and theses database. (Document ID 3474513)

Bachman, L., & Palmer, A. (1996). *Language testing in practice*. Oxford: Oxford University Press.

Byrne, B. (1994). *Structural equation modeling with EQS and EQS/Windows: Basic concepts, applications, and programming*. Thousand Oaks, CA: Sage Publications.

Erskine, D. (2010). *Effect of prompted reflection and metacognitive skill instruction on university freshmen's use of metacognition* (Doctoral dissertation). Available from ProQuest dissertation and theses database. (Document ID 3412778)

Hudson, T. (2007). *Teaching second language reading*. Oxford: Oxford University Press.

IBM. (2011a). SPSS Amos (Version 19) [Software]. Available from http://www-01.ibm.com/software/analytics/spss/products/statistics/amos/

IBM. (2011b). SPSS Statistics (Version 19) [Software]. Available from http://www-01.ibm.com/software/analytics/spss/

Kline, R. (2011). *Principles and practice of structural equation modeling.* New York: Guildford Press.

McNamara, T. (1996). *Measuring second language performance*. London: Longman.

Newell, A., & Simon, H. (1972). *Human problem solving*. Englewood Cliffs, NJ: Prentice Hall.

Phakiti, A. (2003). A closer look at the relationship of cognitive and metacognitive strategy use to EFL reading achievement test performance. *Language Testing*, *20*(1), 26-56.

Phakiti, A. (2006). Modeling cognitive and metacognitive strategies and their relationships to EFL reading test performance. *Melbourne Papers in Language Testing, 11*, 53-102.

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.

Phakiti, A., & Li, L. (2011). General academic difficulties and reading and writing difficulties among Asian ESL postgraduate students in TESOL at an Australian university. *RELC Journal*, *42*(3), 227-264.

Purpura, J. (1998). Investigating the effects of strategy use and second language test performance with high- and low-ability test takers: A structural equation modeling approach. *Language Testing, 15*(3), 333-379.

Purpura, J. (1999). *Strategy use and second language test performance: A structural equation modeling approach.* Cambridge: Cambridge University Press.

Rubin, A. (2010). *Statistics for evidence-based practice and evaluation*. Belmont, CA: Brooks/Cole.

Schmidt, F., & Hunter, J. (1999). Theory testing and measurement error. *Intelligence*, 27, 183-198.

Schreiber, J., Stage, F., King, J., Nora, A., & Barlow, E. (2006). Reporting structural equation modeling and confirmatory factor analysis results: A review. *Journal of Educational Research, 99*(6), 323-337.

Shultz, K., & Whitney, D. (2005). *Measurement theory in action: Case studies and exercises*. Thousand Oaks, CA: Sage Publications.

Wichadee, S. (2011). The effects of metacognitive strategy instruction on EFL Thai students' reading comprehension ability. *Journal of College Teaching and Learning*, *8*(5), 31-40.

Zhang, L., & Seepho, S. (2013). Metacognitive strategy use and academic reading achievement: Insights from a Chinese context. *Electronic Journal of Foreign Language Teaching, 10*(1), 54-69.

Appendix. Metacognitive and Cognitive Strategy Questionnaire

Directions: Read each statement and indicate how you actually thought when taking this reading test.

Circle the option for each statement that best describes how you thought.

1. I planned what to do before I began to complete the reading test.
2. I made sure I clarified the goals of the reading tasks.
3. I considered essential steps needed to complete the reading test.
4. I made sure I understood what had to be done and how to do it.
5. I knew what to do if my intended plans did not work efficiently.
6. I flipped through the reading test before I actually started to complete it.
7. I was aware of the time limitations and constraints in this test.
8. I knew how much of the reading and test tasks remained to be done
9. I knew when I lost concentration while completing this test.
10. I immediately noticed when and where I had any confusion when dealing with the text.
11. I knew when I felt worried, tense or unmotivated to complete this reading test.
12. I checked if I understood the texts and reading tasks.

13. I checked my own performance and progress as I moved along the test tasks.
14. I evaluated my plans or goals of the reading tasks constantly.
15. I knew when I should read or complete the test more quickly or carefully.
16. I double-checked my reading comprehension or performance.
17. I immediately corrected my misunderstanding or performance mistakes when found.
18. I tried to understand the relationships between ideas in the text and tasks.
19. I tried to understand the content of the text and tasks without looking up every word.
20. I thought what was going to happen next while I was reading the text.
21. I analyzed what the author meant or tried to say in the text.
22. I tried to interpret hidden ideas/meanings in the text.
23. I translated the text, tasks or questions into my first language.
24. I summarized the main information in the text.
25. I reread the text or tasks several times when I felt I did not understand them.
26. I related the information from the text or tasks to my prior knowledge or experience.
27. I knew which information was more or less important.
28. I identified or guessed meanings of unknown words using contextual clues.
29. I applied my learned grammar rules while completing the reading tasks.
30. I guessed meanings of unknown words using root words.

Note. Each statement on the questionnaire was followed by this scheme of options:

1	2	3	4	5
Never	Rarely	Sometimes	Often	Always