

Construct validation of the revised Metacognitive Awareness of Reading Strategies Inventory (MARSİ-R) and its relation to learning effort and reading achievement

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Abstract

Language students apply different strategies to learn a second language (L2), especially when they want to attain proficiency in reading. The aim of the present study was to revisit the validity of the *Metacognitive Awareness of Reading Strategies Inventory* (MARSİ-R) among Saudi students using a new statistical method of confirmatory composite analysis (CCA). Past studies modeled MARSİ-R as a *common factor* and applied confirmatory factor analysis (CFA) to test its validity. However, studies struggled to provide support for the validity of the MARSİ-R with each suggesting different model. Instead, we treat the inventory as a *composite*, meaning that the items in MARSİ-R form and define the inventory and not the other way around. We use partial least squared structural equation modeling (PLS-SEM) to allow the composite model to be estimated. The results indicated that the constructs of MARSİ-R are better operationalized as composites not common factors as supported through CCA exclusively. After confirming the nature of the inventory, we evaluated the extent to which MARSİ-R is related to reading proficiency through the mediational mechanism of motivational intensity (i.e., learning effort). Descriptive statistics illustrated that problem-solving strategies

are the most used strategy and that females used the strategies more frequently than their male counterparts. Most importantly, the structural model showed that metacognitive reading strategies only exert an indirect effect on reading proficiency, suggesting that the effect of strategies is mediated by motivational intensity (i.e., learning effort). Thus, motivational intensity seems to be mediator in the relationship between metacognitive reading strategies and reading proficiency. Finally, methodological and educational implications are provided.

Keywords: metacognitive reading strategies; MARSİ; MARSİ-R; construct validity; confirmatory composite analysis (CCA); confirmatory factor analysis (CFA); partial least squared structural equation modeling (PLS-SEM)

1. Introduction

Metacognitive reading strategies are one of the variables that are related to second language (L2) learners' success in reading comprehension and proficiency (Cai & Kunnan, 2020). Interest in the role of metacognitive reading strategies is observable in research studies and edited volumes in the field (see, for example, Cai & Kunnan, 2020; Cohen, 2011; Mokhtari & Reichard, 2002, Oxford, 2017; Phakiti, 2006; Purpura, 1997; among others). In L2 research, the concept of metacognitive reading test-taking strategies is closely related to students' cognition process regarding reading and the self-awareness underlying comprehension of the text (Mokhtari & Reichard, 2002). Although the importance of metacognitive reading strategies has been documented in the literature, the field agrees that they are multifaceted and not easy to assess (Cohen, 2011). A prominent measure of metacognitive reading strategies is the MARSİ (Mokhtari & Reichard, 2002). The questionnaire was designed to evaluate learners' awareness of metacognitive reading strategies when they read academic texts. The MARSİ has three subscales: global reading strategies (GRS), problem-solving strategies (PSS), and support reading strategies (SRS). In essence, the MARSİ instrument (Mokhtari & Reichard, 2002) was originally designed to assess the metacognitive awareness of reading strategies among L1 students, not L2 students, although several authors have used it since its inception to measure the metacognitive awareness of reading strategies among L2 students as well.

The modified version, the MARSİ-R (Mokhtari et al., 2018), is a short version that the authors created by reducing the number of items in the original scale from 30 to 15 based on theoretical and empirical reasons. Mokhtari et al. (2018) provided preliminary evidence of the constructs' validity and reliability. However, methodologically, psychometric properties of MARSİ-R have yet to be established and further investigations are warranted to obtain the best model that mirrors

the theoretical underpinnings of MARSİ-R considering recent advances in the field of structural equation modeling (SEM; Dirsehan & Henseler, 2022; Hair & Alamer, 2022; Henseler & Schubert, 2021; Schubert, 2021; Sparks & Alamer, 2023). Accordingly, the present study attempts to answer three research questions:

- RQ1: How do L2 Saudi undergraduate students of English use the MARSİ-R for reading learning?
- RQ2: What is the best model representation of the internal structure of MARSİ-R?
- RQ3: Are metacognitive reading strategies directly or indirectly linked to L2 students' reading proficiency through motivational intensity (criterion-related validity)?

2. Literature review

Interest in investigating learning processes in L2 research and theory has increased over the past five decades. The shift from examining teaching methods to investigating learning processes has led researchers to focus on the relationship between the processes and products of second language acquisition (SLA) research and learners' strategy use (Purpura, 1997). Similarly, language testing researchers have long been interested in examining the effect of candidates' cognitive characteristics on test performance (Kunnan, 1995; Phakiti, 2003; Purpura, 1997). In test situations, test takers apply language use strategies to enhance their test scores (Cohen, 2011). More specifically, Bachman and Palmer (1996, 2010) proposed a theoretical framework for cognitive and metacognitive strategy use in language testing contexts. Phakiti (2008) classified metacognitive strategies into planning, monitoring, and evaluation strategies. Building on anxiety research in psychology, Phakiti (2008) characterized Bachman and Palmer's (1996, 2010) "strategic competence" as consisting of trait metacognition (i.e., knowledge about cognition) and state metacognition (i.e., regulation of cognition).

2.1. Comprehension processes and strategies for reading texts

Cohen and Upton (2007) maintained that readers consciously and purposefully "do exert a significant level of active control over their reading process through the use of strategies" (p. 211). Specifically, the employment of cognitive strategies to comprehend reading texts assists students with making sense of a text, while metacognitive strategies help to monitor and appraise reading processes (Griffiths, 2018; Schallert & Martin, 2003). Nassaji (2003) noted that cognitive and metacognitive comprehension strategies are used at multiple levels to distinguish

between skilled and less-skilled English as a second language (ESL) readers. For this reason, high-proficiency learners who frequently use reading strategies should not always be considered better readers (Prichard, 2014). That is, strategy use should be tailored to personal choices because not all individuals may find a given strategy beneficial in all contexts and for all purposes (Griffiths & Soruç, 2020). Carrell (1998) showed that successful strategy use and strategy instruction are context-dependent. In addition, Rivera-Mills and Plonsky (2007) argued that there is no recipe for learning strategies that would be suitable for everyone. In order for test takers to succeed in test situations and identify the right answer, "The test items should invoke the construct-relevant strategies L2 test developers intend to use" (Lin et al., 2019, p. 197).

Language testing research has focused on identifying the aspects that cause variation in test takers' performance, chief among which are *processing strategies* (Bachman, 1990). In language testing, Cohen and Upton (2007) classified strategies into three main categories: *language learner strategies* (e.g., confirming final understanding of the passage based on the content and/or the discourse structure), *test management strategies* (e.g., making an educated guess using background or extra-textual knowledge), and *test wiseness strategies* (e.g., using clues from other items to answer the item under consideration). Cohen (2006) considered test management and test wiseness strategies to be test-taking strategies, and drew a clear distinction between those and language learner strategies. Test management strategies are used to respond meaningfully to test items and tasks, whereas test wiseness strategies are used to respond to language tests without the use of L2 knowledge and performance ability (Cohen, 2013). Test-taking strategies can assist test takers with overcoming the challenges they face in test situations. Gebril (2018) noted that giving test takers appropriate test-taking strategies can enhance their test performance. Based on this distinction, this study will investigate the metacognitive strategies students use when taking a reading test at the B2 test.

2.2. Studies on strategies used during reading tests and test performance

Language testing researchers have recognized the crucial role of cognitive and metacognitive strategies in the variation in language test performance. For instance, Purpura (1998) examined the impact of metacognitive strategy use on candidates' B2 test performance and found variation across the high- and low-ability groups in terms of lexico-grammatical and reading ability, based on the test takers' use of retrieval and metacognitive strategies. Similarly, Phakiti (2006) investigated cognitive and metacognitive strategies in relation to 358 students' reading test performance using the structural equation modelling (SEM)

approach. He found that (1) memory and retrieval strategies promoted the candidates' performance through comprehension strategies; (2) monitoring strategies had an "executive function" in relation to memory strategies, while evaluating strategy-controlled retrieval strategies; (3) planning strategies did not directly control memory, retrieval, or comprehension strategies, yet they controlled such cognitive strategies through monitoring and evaluation strategies; and (4) only comprehension strategies had a direct impact on students' performance in the EFL reading test (Phakiti, 2006). Similarly, Zhang et al. (2014) explored the relationships between test takers' metacognitive and cognitive strategy use and their test performance after sitting for an English as a foreign language (EFL) reading test. Using a multi-sample SEM approach, their study comprised a total of 593 students. The findings of the study indicated that students' strategy use significantly influenced their lexico-grammatical reading ability. In contrast, Lin et al. (2019) found in their study, which had a total sample of 552 test takers, that only cognitive strategies had a direct impact on test takers' reading test performance, whereas metacognitive strategies indirectly influenced test takers' performance. However, metacognitive strategies had a strong effect on cognitive strategies. Recently, Wallace et al. (2021) investigated EFL readers' metacognitive strategy use in terms of gender and reading ability. Using the MARSi, they found that the participants in their study used PSS more frequently than any other strategy. GRS was used significantly more often than SRS. Moreover, their findings showed that gender differences did not affect strategy use.

2.3. MARSi and MARSi-R

The *metacognitive awareness of reading strategies inventory* (MARSi) was developed by Mokhtari and Reichard (2002). It is a self-report scale constructed to measure students' generalized use and awareness of different metacognitive reading strategies applied to the reading and comprehension of texts. The MARSi scale has been useful in the field; however, the authors identified issues pertaining to the original scale, such as its appropriateness for college and adult readers, time consumption, and the generalized nature of the directions (for an in-depth discussion, see Mokhtari et al., 2018). In an attempt to resolve these issues, the researchers made a few modifications and shortened the scale. In its modified version (i.e., the MARSi-R), the scale was reduced from 30 to 15 items, as some statements covered the same reading strategy constructs. The MARSi-R measures the same three constructs: GRS, PSS, and SRS. Mokhtari et al. (2018) validated the MARSi-R by using confirmatory factor analysis (CFA). In sum, based on the misspecifications and related substantive considerations in the original MARSi, the number of items was significantly reduced, and the validity of the

MARSI-R was claimed to be established. Nonetheless, empirical studies have been struggling with replicating this refined version in other socio-cultural contexts. Although the inventory has undergone different validity assessments (see for example Ondé et al., 2022), this was only done using CFA (by assuming MARSI-R as common factor). Nevertheless, CFA is not the most appropriate analytical tool for validating such composite constructs as we will explain later.

2.4. Motivational intensity as a mediator

Learning an L2 is more likely to be successful when the language learners exert effort necessary to integrate more with the language tasks. Similarly, learners who are aware of a set of learning strategies are less likely to proceed well in the language learning process if they do not put effort necessary for the learning to happen (Alamer, 2022a, 2022b; Gardner, 2010; Griffiths, 2018). Motivational intensity is defined as the expended effort the language learners exert to learn the language (Gardner, 2010). As such, it can be hypothesized that for the metacognitive reading strategies to explain students' reading achievement, learning effort should be considered as a means that translates into the awareness and use of metacognitive reading strategies. That is, it is postulated that learners who recognize which metacognitive reading strategies to use and then expend the learning effort are likely to have higher scores on reading achievement. Thus, motivational intensity can be said to operate as a proximal variable that mediates the effect of metacognitive reading strategies on reading achievement (Arabai & Alamer, 2022; Griffiths, 2018). This indirect process has been less studied in the field; as such, the present study investigates the potential mediating role of motivational intensity between the predictor and the outcome.

2.5. Methodological issues related to the validity of MARSI-R and other related constructs

The dominant type of model used in the field for testing the internal structure of language learning strategies in general and MARSI-R in specific is the common factor model. Common factor models are typically applied through exploratory factor analysis (EFA), and CFA (Alamer, 2022c; Alamer et al., in press). In common factor models, the items (i.e., indicators) are conceptually viewed as interchangeable and similar in meaning; thus, the measurement model assumes that the items similarly reflect the construct (Schuberth, 2021; Schuberth et al., 2022). As such, items should be highly correlated because they are targeting one specific domain from slightly different angles. In this way, any item could be removed from the construct without changing its overall meaning (Hair & Alamer, 2022). When the construct follows this definition,

it should be referred to as a *latent variable* or *common factor* (Schuberth et al., 2018). In the common factor model, the relationship goes from the factor to the items, meaning that if the conceptual meaning of the latent variable changes, all items should be changed simultaneously.

In contrast to the common factor, *emergent variable* or *composite* comes as another type of construct configuration. The composite postulates that items constitute (i.e., define) the construct in a linear combination. Each item in the composite holds unique information about the construct that is not expressed by the remaining items in the scale/inventory (Alamer et al., in press). Therefore, removing any item from the model likely alters the construct meaning (Henseler & Schuberth, 2021). Accordingly, items in the composite model should *not* be highly correlated. When the construct follows this definition, it should be referred to as a *composite* (also called *emergent variable* and *formative construct*) (Dirsehan & Henseler, 2022; Schuberth et al., 2018). Hence, the relationship in the composite model goes from the items to the construct, meaning that the indicators independently form the construct. An example for a construct that follows composite definition from L2 literature is *language achievement* (e.g., Sparks & Alamer, 2022, 2023). See Figure 1 for a visual representation of *latent* and *emergent* variables.

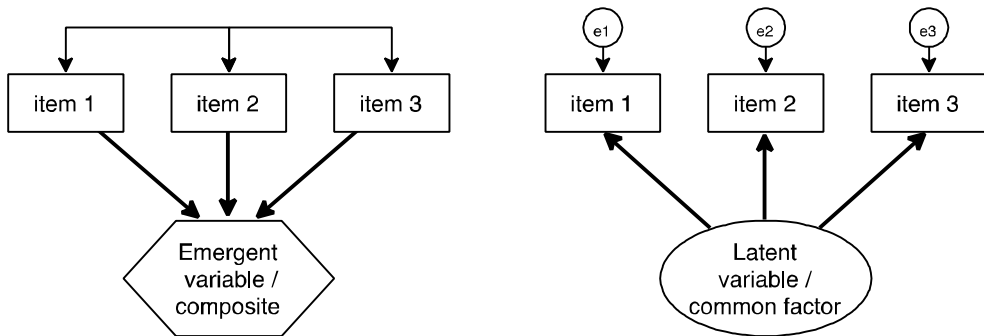


Figure 1 Visual representation of CCA (on the left) and CFA (on the right)

When using CFA, the researcher assumes the constructs as latent variables. However, forcing emergent variables to work under the common factor approach (i.e., through CFA) is inappropriate. Nonetheless, metacognitive reading strategies perfectly fit the definition of emergent variable because each item on the inventory represents a specific (i.e., distinct) aspect of the construct that is conceptually different from other items in the inventory. Alternatively, confirmatory composite analysis (CCA) has been developed to allow for the assessment of emergent variables (Henseler, & Schuberth, 2021; Schuberth et al., 2018). To apply CCA, researchers often rely on partial least squares structural equation modeling (PLS-SEM). PLS-SEM is a composite-based method that allows emergent variables

(i.e., composite) to be easily estimated (Alamer et al., 2022; Dirsehan & Henseler, 2022; Hair & Alamer, 2022). Among its benefits, PLS-SEM allows emergent variables to be estimated without identification issues that CFA faces. It allows higher-order constructs made of (caused by) lower-order constructs to be easily specified without special requirements (see Alrabai & Alamer, 2022 for an empirical example in L2 research). We believe that applying PLS-SEM to assess the composite model as well as the structural model is an important methodological contribution to the evaluation of MARS-I-R and other similar measures in the field (see Hair & Alamer, 2022 for PLS-SEM guidelines in L2 domain). Based on the available literature, which will be discussed next, the postulated relationships in the process model are depicted in Figure 2.



Figure 2 The structural (conceptual) model of the relationships linking metacognitive reading strategies, motivational intensity, and reading proficiency (Constructs represented in hexagon denote composite; those represented in oval denote common factor; those represented in rectangle denote observable variable (sum/mean value))

3. Method

3.1. Participants

The participants in the present study were undergraduate students enrolled in one language level (intermediate level) at two Saudi public universities. The original invitation was sent to around 200 students enrolled in the two universities. Convenient sampling was utilized, and 108 students completed the questionnaire. All participants spoke Arabic as their first language and were enrolled in the Department of English studying English as an L2. Their ages ranged from 18 to 35 years ($M_{age} = 22.73$, $SD = 2.72$). The participants were students nested in their classes. Thus, the language level of the participants was largely similar (intermediate), which was also confirmed by their teachers. Regarding gender composition, 30.23% of the participants were male, while 69.77% were female. All students enrolled in the Department of English at the two universities were invited via a message sent using a Telegram channel dedicated to student announcements.

Those who were willing to participate simply clicked the link provided in the message to access an online questionnaire created using Google Forms. A total of 108 students completed the online questionnaire. The study procedure was reviewed and approved by the Department of English in the involved universities. The participants provided their written informed consent in the online questionnaire to participate in this study. The participants were not trained or prepared to take part in the reading test used in this study. Also, they had not received any instructions about reading strategies, though some textbooks from some language courses may have described some types of strategies.

3.2. Instruments

3.2.1. MARSİ-R

This study utilized the revised version of the MARSİ questionnaire (MARSİ-R), which consists of 15 items. Mokhtari et al. (2018) reduced the number of items measuring global strategies in the original version from 30 to 15 in the revised version. Participants were asked to indicate the extent to which they use the following strategies when they read English texts on a 5-point scale ranging from "I have never heard of this strategy before" to "I know this strategy quite well, and I often use it when I read." The three subscales comprising the MARSİ-R are: (1) GRS, for which an example item is "Previewing the text to see what it is about before reading it," (2) PSS, for which an example item is "Getting back on track when getting sidetracked or distracted," and (3) SRS, for which an example item is "Using reference materials such as dictionaries to support my reading" (see Appendix A for full scale items).

3.2.2. Motivational intensity

Motivational intensity (also called *effort* in the literature) was measured using Gardner's (2010) scale. The scale has five items and is a self-reported measure that uses a 5-point Likert-type response format. The participants were asked to indicate the extent to which each statement represented their efforts. An example item is "I really work hard to learn English." The internal consistency reliability of this variable in this study was .80.

3.2.3. Reading proficiency

This study used the B2 First test, formerly known as Cambridge English: First (FCE). The B2 test is a test of the English language at level B2 based on the Common European Framework of Reference (upper-intermediate level). The test measures

four skills: listening, reading, writing, and speaking. Of the seven parts in the reading test, the researchers selected a free sample part which was a reading passage followed by eight questions from the Cambridge website (see an example in Appendix B). The whole reading test lasts for one hour 15 minutes. The focus of this part of the test is on detail, opinion, attitude, tone, purpose, main idea, gist, meaning from context, implication and text organization features (e.g., exemplification, reference). It follows the format of a text followed by six 4-option multiple-choice questions. The reading part of the B2 test was given to 108 students who participated in the study right after they had filled out the general information part about their reading levels. This was an external measure which functioned as a self-perception measure of students' reading ability (Mokhtari et al., 2018). The item reads as follows: "I consider myself (1) an excellent reader, (2) a good reader, (3) an average reader, or (4) a poor reader." The aim of this item was to be included in the reading achievement construct as it hypothetically contributes to students achievement of the language. The test was administrated to the students, and they were given the choice to withdraw if they have changed their mind about participation. Because this is a one item scale, no reliability test was reported.

3.3. Statistical analyses

3.3.1. Data screening and assumptions

Before we analyzed the data, a preliminary check was conducted for missing data, normality, and outliers. Although normality of the data is not assumed by PLS-SEM (Hair & Alamer, 2022), it was assessed graphically and statically for extreme values by checking the Q-Q plots as well as the skewness and kurtosis values to check. Outliers are data points that depart from the rest of the data points. In addition, a check was performed to ensure that the dataset was free from carelessness and intentional idiosyncrasies (e.g., answering all items with one response).

3.3.2. Construct validity of the composite model

To evaluate PLS-SEM models, researchers are required to assess the composite model first before assessing the structural model. The evaluation of the composite differs from common factor as it relies on three different indices (Hair & Alamer, 2022; Dirsehan & Henseler, 2022): (1) convergent validity, which is established by evaluating the relationship between the composite (also called formative measure) with a measure that generally reflect the phenomenon. In our case, we evaluate the extent to which the three strategies are positively associated with a general statement dictating the extent to which students use metacognitive reading

strategies as follows: “Overall, I use different metacognitive reading strategies” a scale out of five are presented from “quite frequently” to “quite rarely;” (2) lack of multicollinearity, which is assessed by variance inflation factor (VIF) with values of 5 or greater indicating serious collinearity; and (3) the size and significance of the indicators weights and loadings of composite constructs, which should be positive and significant. We also report the SRMR of the composite model with $SRMR < .08$ as the suggested cut-off value (Dirsehan & Henseler, 2022).

3.3.3. Evaluating the structural model

The structural model was examined using two measures: (1) the coefficient of determination (R^2) in the outcome variable and (2) $PLS_{predict}$ which assess the out-of-sample predictive power (Hair & Alamer, 2022; Sparks & Alamer, 2023). In $PLS_{predict}$, we compare the value of root mean squared error (RMSE) in the PLS model with the naive linear regression model (LM). The model has good predictive power when it generates lower RMSE values in the PLS model compete to the LM model (Hair & Alamer, 2022). The structural model should also be free from collinearity issues by inspecting the VIF value in the path coefficients. Note that PLS-SEM can handle latent and emergent variables in one structural model (Alamer et al., 2022; Hair & Alamer, 2022).

4. Results

4.1. Preliminary analysis

Data screening revealed no concerns regarding missing data, carelessness, or outliers. However, visual inspection of the data through Q-Q plots suggested that the data depart slightly from normality. The skewness and kurtosis values confirmed this, as seven variables slightly violated the cut-off values. Accordingly, normality was not ideally established; thus, we used tests and estimations that are robust to non-normal and ordinal data.

4.2. Main analyses

To answer RQ1 (How do L2 Saudi undergraduate students of English use the MARS-R for reading learning?), in general, PSS was the most reported type of strategy ($M = 4.07$, $SD = .71$), followed by SRS ($M = 3.83$, $SD = .84$) and GRS ($M = 3.64$, $SD = .75$). To investigate whether male and female students hold similar endorsements of these strategies, a t -test (Welch’s version) was conducted. Levene’s homogeneity test indicated that the equal variances assumption was

met (p values $> .05$). Results of the Welch's test showed that gender was significantly different for GRS (Welch's $t = -4.59$, $df = 76.83$, $p < .001$, $d = -.92$, d 95% CI [-1.36, -.47]) and SRS (Welch's $t = -5.03$, $df = 70.37$, $p < .001$, $d = -1.03$, d 95% CI [-1.51, -.59]) in favor of females (see Figure 3), while PSS did not show significant differences (Welch's $t = -1.67$, $df = 82.36$, $p = .09$, $d = -.33$, d 95% CI [-.73, .07]).

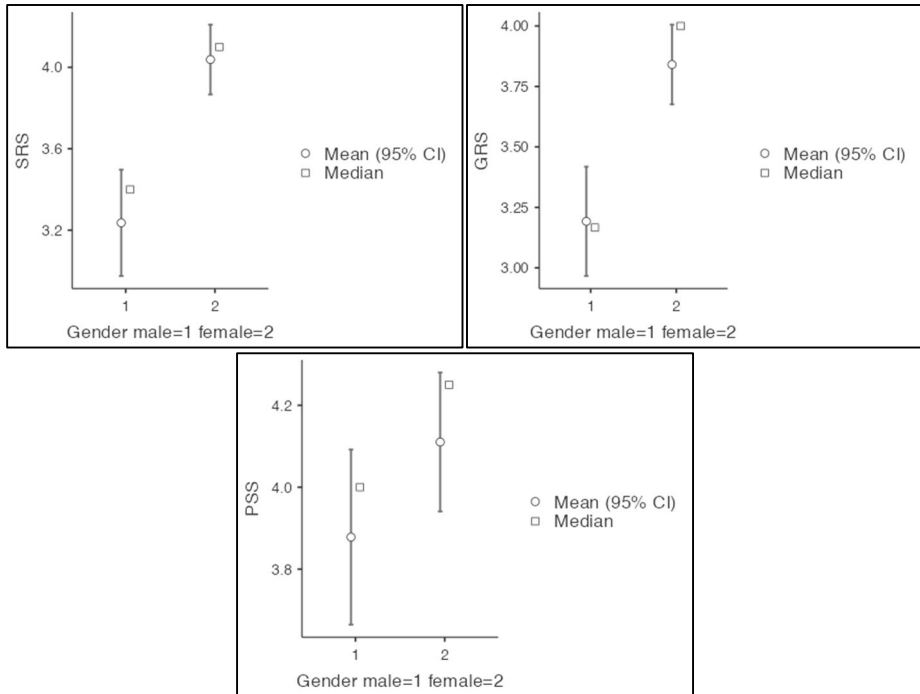


Figure 3 Descriptive plots of the mean differences in SRS, GRS, and PSS with a 95% CI

To answer RQ2 (What is the best model representation of the internal structure of MARSIR?), we evaluate the composite model through CCA (Alamer et al., in press; Henseler & Schuberth, 2021; Schuberth, 2021) to establish the construct validity of MARSIR which is a precedent of assessing the structural model. First, convergent validity was tested by regressing each construct of MARSIR on the single-item measure of the general use of metacognitive reading strategies. The results indicated that GRS, PSS, and SRS predicted the general metacognitive reading strategies use item sufficiently ($\beta = .70$, $.59$ and $.50$, respectively); all regression paths were significant at $p < .001$. Next, an assessment of multicollinearity was considered using VIF measure. Our analysis showed all items were below 3 (i.e., $VIF < 3$) indicating lack of collinearity in the indicators. Finally, the sizes and significance of the indicators weights and loadings as shown in Table 1 illustrated that all weights are positive and all were significant at $p < .01$, with an exception to one item on PSS

(item 5) whose weight was relatively weak. However, following Hair and Alamer (2022) guideline, items on composite measure should not be removed automatically based on empirical suggestions but must be informed by theory. Hair and Alamer (2022) explain that an item in composite may be considered for removal if both weight and loading are significantly negative which is not the case here. In addition, we believe that retaining this item “Guessing the meaning of unknown words or phrases” is conceptually justified to maintain the fuller understanding of the PSS. Note that having the loading of this item significant (i.e., p value < .05) we have further reason to retain this item.

Table 1 Item weights and loadings of GRS, PSS, SRS in the composite (CCA) and common factor models (CFA)

Items	Composite weights in CCA model	Composite loadings in CCA model	Factor loadings in CFA model
<i>GRS items</i>			
purpose	.21	.45	.51
preview	.26	.52	.84
check	.31	.67	.77
typographical	.34	.72	.37
analyzing	.37	.65	.40
<i>PSS items</i>			
get back	.34	.70	.82
adjust	.36	.61	.39
stopping	.40	.77	.52
re-reading	.29	.65	.73
guessing	.06	.23	.30
<i>SRS items</i>			
notes	.39	.65	.66
aloud	.21	.35	.35
discuss	.24	.51	.29
underly	.52	.91	.73
reference	.14	.44	.28
<i>Correlation</i>			
GRS with PSS		.55	.43
PSS with SRS		.55	.63
GRS with SRS		.56	.52

Note. All items are significant at $p < .01$

To ensure that composite model is a more appropriate representation of the inventory than the common factor model, we compare the results of CCA to CFA. A CFA model with three factors has resulted in a poor fitted solution (i.e., $\chi^2 = 333.73$, $df = 87$, $p < .001$, CFI = .53, TLI = .44, SRMR = .12, RMSEA = .16). More importantly, there are several factor loadings in the model that are weak in magnitude (i.e., < .50) which, when assessed through common factor model, are candidate for removal to achieve better model fit. In contrast, the model fit

in the CCA showed that SRMR was .08 and that the composite weights and loadings were in the expected directions. Therefore, our analysis supports MARSI-R through the composite model exclusively, thus we continue with this type of model specification when evaluating the structural model.

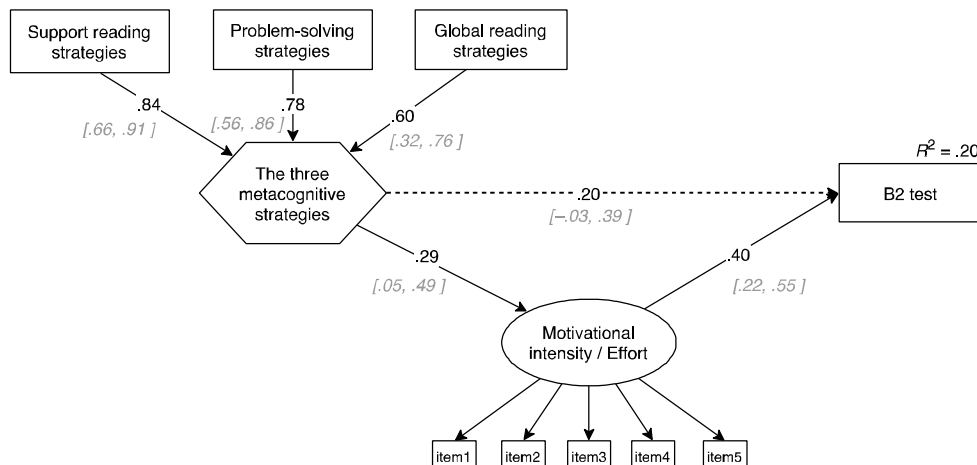


Figure 4 The structural model linking metacognitive reading strategies, motivational intensity, and reading achievement (Italicized and gray values represent 95% bias-corrected confidence intervals (CI). Dashed lines indicate non-significant paths. Constructs represented in hexagon denote composite constructs)

Table 2 Standardized indirect and total effects in the structural model

Paths	<i>b</i>	<i>p</i>	<i>CI 95%*</i>
Metacognitive reading strategies -> motivational intensity -> reading proficiency	.12	.02	.05, .26
<i>Metacognitive reading strategies (total effect)</i>	.32	<.01	.39, .68

Note. * Based on the bias-corrected confidence intervals

To answer RQ3 (Are metacognitive reading strategies directly or indirectly linked to L2 students' reading proficiency through motivational intensity?), we run the structural model within PLS-SEM. The assessment of the structural model as shown in Figure 4 starts with inspecting the R^2 value on the outcome variable, which was found to be medium in size ($R^2 = .20$) (Hair & Alamer, 2022). The direct effects are presented in Figure 4, along with their 95% confidence intervals (CIs), while the indirect and total effects are provided in Table 2. We ran PLS_{predict} analysis to assess the model's out-of-sample prediction ability, following Shmueli et al.'s (2019) and Hair and Alamer's (2022) recommendation. Our results showed that the model had good out-of-sample predictive power, that is, the PLS model showed lower errors (i.e., RMSE = .935) compared to the linear regression (LM) model (i.e., RMSE = .983). This implies that the hypothesized structural model has

predicted scores that are unused when executing the PLS model. Thus, the analysis illustrates evidence of the external validity of our results.

As is evident in Figure 4, metacognitive reading strategies only exerted a direct effect on motivational intensity, and that effect was moderate in size ($\beta = .29$, 95% CI: [.05, .49]); metacognitive strategies had no direct effect on reading proficiency. Only motivational intensity directly affected reading proficiency, and that effect was moderate in magnitude ($\beta = .40$, 95% CI: [.22, .55]). Thus, it can be said that motivational intensity functioned as a mediator in the relationship between metacognitive reading strategies and reading proficiency. This was substantiated by inspecting the indirect effect, which was significant ($\beta = .07$, 95% CI: [.01, .21]). Regarding the total effect, a strong link was found between metacognitive reading strategies and reading proficiency ($\beta = .52$, 95% CI: [.39, .68]). Overall, the structural model substantiated the nature of the association between metacognitive reading strategies and reading proficiency. Most importantly, although the effect of metacognitive reading strategies on reading proficiency was not significant, it was substantial and meaningful when considering the mediator (i.e., motivational intensity).

5. Discussion

The present study aimed to replicate the findings pertaining to the MARSİ-R by assessing its construct and criterion validity using the advanced method of PLS-SEM in the Saudi context. As for the RQ1, the present study suggested that a model for the MARSİ-R, where SRS, PSS, and GRS are operationalized as common factor model through CFA is infeasible, and thus not supported. As psychometric research explained (Schuberth et al., 2018), CFA are typically used to assess common factor models that assume items to be interchangeable, representing a unidimensional construct, and share very similar meaning. Common factor models conducted through CFA requires the items to be highly correlated as well as interchangeable, such that item removal does not affect the overall meaning of the construct (Alamer & Marsh, 2022; Alamer et al., in press). However, items on metacognitive reading strategies inventory (among other constructs with a similar structure) hold unique details about the construct such that any removal likely changes the conceptual meaning of the construct (Arabai & Alamer, 2022; Henseler & Schuberth, 2021; Sparks & Alamer, 2022, 2023). Our selection of CCA to assess the composite model excellently reflected this empirical observation and displayed that MARSİ-R should be operationalized as *emergent variable*, not *latent variable* (Henseler & Schuberth, 2021; Schuberth, 2021).

In this regard, the findings of this research add important details about the psychometric properties of certain types of scales in the field (Mokhtari et al., 2018; Mokhtari & Reichard, 2002; Phakiti, 2008; Purpura, 1997). In fact, in their

MARSI-R validation study, Mokhtari et al. (2018) reported that they encountered “numerous cross-loadings for items and correlated errors between items” while fitting the standard CFA model (p. 227). Empirically, it is vital to inform the field of the expected challenges when forcing the constructs to work according to the other construction domain (e.g., forcing composite to operate in a common factor model). If such misspecified model is assumed, researchers are often obliged to apply data-driven modifications to compensate for ill-fitted models (Alamer, 2022c; Alamer & Marsh, 2022; Alrabai & Alamer, 2022). Nonetheless, procedures such as multiple removal of items and multiple correlation of error terms negatively affect the quality of the internal structure of the models, which consequently provide questionable evidence of the construct validity of the instrument under assessment (Shao et al., 2022). We encourage researchers in metacognitive reading strategies in general to consider composite models in their analysis.

With respect to RQ2, the results of this study showed that PSS was the most reported type of strategy. This may indicate that these students were strategic when they faced reading difficulties reading English texts. This finding is consistent with Wallace et al. (2021), who found that their study participants used PSS more frequently than any other strategy. In contrast, our study found that SRS was used more frequently than GRS. This may suggest that the students in this study are independent and autonomous in their learning and thus need less help from their teachers. On the other hand, this study identified significant gendered differences in GRS and SRS in favor of females, while PSS did not show significant differences. This gendered difference may suggest that females were actively engaged during the reading process, which, in turn, would be related to positive reading comprehension. This is consistent with Chambers-Cantrell and Carter (2009), who found that females used PSS, SRS, and GRS more than males.

With respects to RQ3, metacognitive reading strategies appeared to be only indirectly related to reading proficiency through motivational intensity (i.e., learning effort). This is consistent with Cohen and Upton (2007), who found that readers consciously and purposefully tend to be persistent in their reading process through the use of strategies. Only motivational intensity exerted a direct effect on reading proficiency, and that effect was moderate in magnitude. This finding supports the conclusion that higher levels of reading engagement, can lead to more proficient reading comprehension (Guthrie et al., 2004). This conclusion is similar to what L2 motivation literature often reports (see Alamer, 2022a, 2022b; Oxford, 2017). Thus, it can be said that motivational intensity can be a mediator in the relationship between metacognitive reading strategies and reading proficiency. Regarding the total effect, it was found that metacognitive reading strategies were moderately linked to reading proficiency, considering the two paths. Overall, the structural model substantiated the nature of the association between metacognitive reading strategies

and outcomes, which is consistent with mainstream L2 metacognitive research (Cohen, 2011; Cohen & Upton, 2007; Phakiti, 2008).

6. Pedagogical implications

The present study has pedagogical implications for language learning and teaching. The findings of this research showed that male students reported less use of the three reading metacognitive strategies, with PSS and SRS being significantly different across the two genders. Therefore, L2 teachers can promote the use of these strategies among their students, with a particular focus on male students. Although females are often seen as more active in applying these strategies (see Griffiths, 2018) teachers may keep this in mind to remind their male students about these strategies' usefulness for improving their reading proficiency. Teachers should also highlight metacognitive strategies' conditional effect of increasing students' reading attainment. As the present study has shown the indirect effect from reading metacognitive strategies to reading achievement, this might indicate that the effect of reading metacognitive strategies is better understood through effort (motivational intensity). Therefore, teachers should ensure that students not only beware of the available reading metacognitive strategies to employ but also, students need to be reminded that exerting effort and showing persistence to achieve the reading proficiency is key for the effect of strategies to be observed.

7. Limitations

Although the present study provided insight into the validity of the MARSIR model and the effects of reading metacognitive strategies on reading proficiency, it has limitations. First, although the study achieved the minimum sample size required to run PLS-SEM (Hair & Alamer, 2022), the sample size was not sufficiently large to generalize the results to the Saudi population. However, we can hypothesize that students who share similar characteristics as the study participants may exhibit similar patterns regarding the use of reading metacognitive strategies, thus leading to a similar conclusion. This is supported by the results of the PLS_{predict} analysis as it showed that our model predicted unseen scores in the original analysis, thus supporting the external validity of the results (Alamer et al., 2022).

In addition, the present study was limited by the number of variables included in reading metacognitive strategies' predictive literature. It is known from the literature that learning strategies do not operate in isolation of other individual difference variables (Oxford, 2017). Our study involved the evaluation of motivational intensity as a possible mediator, and the results showed that its inclusion was rather meaningful; thus, including other antecedents and consequences

of metacognitive strategy use can be beneficial for theoretical and empirical research in this area.

8. Conclusion

In conclusion, our study achieved three main objectives related to deepening the understanding of metacognitive strategies. The first aim was to replicate the findings of previous studies on the MARSİ-R in the context of Saudi Arabia. We investigated validity of the MARSİ-R considering a composite model, not a common factor model. To do so, we applied CCA first and compared it to CFA. We found that MARSİ-R is only supported through CCA which suggested that MARSİ-R is made of emergent variables, not latent variables. Moreover, we evaluated the extent to which Saudi students use the three strategies and whether there were significant gendered differences in their use of the GRS, PSS, and SRS subscales. Finally, we tested the explanatory power of the MARSİ-R in a mediational model in which motivational intensity was positioned as a mediator in the relationship between reading metacognitive strategies and reading proficiency. Our findings illustrated the ways in which reading metacognitive strategies are connected to reading performance. This research offers theoretical, methodological, and pedagogical implications for the field of language learning.

Acknowledgment

This work was supported by the Deanship of Scientific Research, Vice Presidency for Graduate Studies and Scientific Research, King Faisal University, Saudi Arabia [Grant No. 2670].

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APPENDIX A

MARSI-R scale items (Mokhtari et al., 2018)

Strategy scale

1. I have never heard of this strategy before.
2. I have heard of this strategy, but I don't know what it means.
3. I have heard of this strategy, and I think I know what it means.
4. I know this strategy, and I can explain how and when to use it.
5. I know this strategy quite well, and I often use it when I read.

Strategies 1-15

01. Having a purpose in mind when I read.
02. Taking notes while reading.
03. Previewing the text to see what it is about before reading it.
04. Reading aloud to help me understand what I'm reading.
05. Checking to see if the content of the text fits my purpose for reading.
06. Discussing what I read with others to check my understanding.
07. Getting back on track when getting side tracked or distracted.
08. Underlining or circling important information in the text.
09. Adjusting my reading pace or speed based on what I'm reading.
10. Using reference materials such as dictionaries to support my reading.
11. Stopping from time to time to think about what I'm reading.
12. Using typographical aids like bold face and italics to pick out key information.
13. Critically analyzing and evaluating the information read.
14. Re-reading to make sure I understand what I'm reading.
15. Guessing the meaning of unknown words or phrases.

APPENDIX B

An example of a B2 reading test

You are going to read an article about a woman who trains actors in fighting skills. For questions 31 – 36, choose the answer (A, B, C or D) which you think fits best according to the text.

Mark your answers on the separate answer sheet.

Kombat Kate

James Stanton meets 'Kombat Kate' Waters, who trains theatre actors in how to 'fight' on stage.

There must be few occasions when it would be really rude to refuse an invitation to head-butt someone you've just met! But I'm in one of those right now. I'm in a rehearsal room in a theatre with a group of actors, facing up to stage fighting director Kate Waters. I've already dragged her around the room and slapped her on the arm. Now she wants me to head-butt her. But fear not, this is all strictly pretend!

'Imagine there's a tin can on my shoulder,' she says. 'Now try to knock it off.' I lower my head as instructed, then lift it sharply, aiming for the imaginary can, hoping desperately that I don't miscalculate the angle and end up doing damage to her face. To my amazement, I get it right. 'That was good,' says Waters. 'Now maybe try it again without smiling.'

Waters, known in the industry as Kombat Kate, is showing me how actors fight each other without getting hurt, and that includes sword-fighting. (She inspires fierce devotion: when I tweet that I'm meeting Waters, one actress friend responds: 'She's amazing. She taught me how to be a secret service agent in two days.')

Perhaps the most famous play Kate has worked on recently was called *Noises Off*. She taught the cast how to fall down stairs without breaking any bones. One of the fight scenes is fairly close, Kate tells me, to the one we're trying out now. 'I've just slowed it down a bit,' she says tactfully, before inviting me to throw her against the wall. I obey, making sure I let go of her quickly, so she can control her own movement. Push your opponent too hard, and they will hit the wall for real. I watch her hit the wall before falling to the ground. She's fine, of course. 'That's my party trick,' she says with a grin. 'Works every time.'

Once the lesson is over Kate tells me how she became one of only two women on the official register of stage fight directors. Already a keen martial arts expert from childhood, Kate did drama at university, and one module of her course introduced her to stage combat. When she made enquiries about the possibility of teaching it as a career, she was told about the register and the qualifications she'd need to be accepted onto it.

line 22 It was no small order: as well as a certificate in advanced stage combat, she would need a black belt in karate and proficiency in fencing, a sport she'd never tried before.

But she rose to the challenge and taught the subject for several years at a drama college before going freelance and becoming a fight advisor for the theatrical world. The play she's working on is Shakespeare's *Richard III*. This involves a famous sword fight. With no instructions left by the great playwright other than – Enter Richard and Richmond: they fight, Richard dies – the style and sequence of the fight is down to Kate and the actors.

'I try to get as much information as possible about what a fight would have been like in a particular period,' Kate explains. 'But because what I'm eventually doing is telling a dramatic story, not all of it is useful. The scene has to be exciting and do something for the audience.'

line 30

Ultimately, of course, a stage fight is all smoke and mirrors. In our lesson, Kate shows me how an actor will stand with his or her back to the audience ahead of a choreographed slap or punch. When the slap comes it makes contact not with skin but with air: the actor whacks his chest or leg to make the sound of the slap.

In the rehearsal room, I can't resist asking Kate how she thinks she would fare in a real fight. Would she give her attacker a hard time? She laughs, 'Oh, I'd be awful,' she says. 'I only know how to fake it.' I can't help thinking, however, that she's just being rather modest.

- 31 In the first paragraph, the writer is aware of
- A a critical attitude from Kate.
 - B the concern of the other actors.
 - C the need to reassure his readers.
 - D having been in a similar situation before.
- 32 How does the writer feel when Kate mentions the tin can?
- A worried about hurting Kate
 - B relieved that Kate is just pretending
 - C concerned that it may injure his head
 - D convinced that he won't take it seriously enough
- 33 When Kate and the writer repeat the fight scene from *Noises Off*, we learn that
- A the writer isn't sure of his instructions.
 - B Kate has adapted it slightly for the writer to try.
 - C the writer is initially unwilling to do it.
 - D Kate has to react quickly to a mistake the writer makes.
- 34 What does the phrase 'no small order' (line 22) tell us about stage combat?
- A Kate knew she would love learning about it.
 - B It is something very few people ever perfect.
 - C Studying it required a lot of obedience and respect.
 - D Qualifying to teach it would be a long and difficult process.
- 35 What does the writer tell us about the sword fight in the play *Richard III*?
- A Its details need to be made up.
 - B It's a particularly challenging scene to do.
 - C Its action is conveyed through spoken words.
 - D It is widely agreed to be the most exciting of its kind.
- 36 What does 'it' refer to in line 30?
- A information
 - B a fight
 - C a particular period
 - D a dramatic story