Motivation, Strategy, and EFL Vocabulary Learning: A Structural Equation Modeling Study

Abstract

Background. In spite of considerable advancements in our understanding of the different factors involved in achieving vocabulary-learning success, the overall pattern and interrelationships of critical factors involved in L2 vocabulary learning – particularly, the mechanisms through which learners regulate their motivation and learning strategies – remain unclear.

Aims. This study examined L2 vocabulary learning, focusing on the joint influence of different motivational factors and learning strategies on the vocabulary breadth of adolescent learners of English as a Foreign Language (EFL) in China.

Sample. The participants were 107 tenth graders (68 females, 39 males) in China.

Methods. The data were collected via two questionnaires, one assessing students' motivation toward English vocabulary learning and the other, their English-vocabulary learning strategies, along with a test measuring vocabulary breadth.

Results. Structural equation modeling (SEM) indicated that learning strategy partially mediated the relationship between motivation (i.e., a composite score of intrinsic and extrinsic motivation) and vocabulary learning. Separate SEM analyses for intrinsic (IM) and extrinsic motivation (EM) revealed that there were significant and positive direct and indirect effects of IM on vocabulary knowledge; and while EM's direct effect over and above that of learning strategies did not achieve significance, its indirect effect was significant and positive.

Conclusions. The findings suggest that vocabulary-learning strategies mediate the relationship between motivation and vocabulary knowledge. In addition, IM may have a greater influence on vocabulary learning in foreign-language contexts.

The importance of vocabulary knowledge to second-language (L2) learning has been well documented (Nation, 1983; Schmitt, 2008). Studies of vocabulary learning have been devoted to unveiling the secrets of individual differences in vocabulary knowledge among learners, with some examining the role of motivation in the process (Fan, 2003; Fontecha & Gallego, 2012; Tseng & Schmitt, 2008; Zheng, 2012) and others identifying learning strategies as a crucial factor in predicting learning success (Barcroft, 2009; Fan, 2003; Farajee & Arabmofrad, 2015; Gu & Johnson, 1996; Ranalli, 2013). Despite increases in our understanding of the different factors involved in vocabulary-learning success, however, the overall pattern and interrelationships of critical factors involved in L2 vocabulary learning remain unclear; and this is particularly so, in the case of the mechanisms through which learners regulate their motivation and learning strategies.

To fill this research gap, this study examined L2 vocabulary learning, drawing upon the theoretical framework of self-regulated learning (SRL) and focusing on the joint influence of different motivational factors and learning strategies on the vocabulary breadth of adolescent learners of English as a Foreign Language (EFL) in China. SRL describes a self-directed process whereby learners autonomously transform their beliefs and regulative abilities into academic skills (Zimmerman, 1986; 2002; 2008), and regards students as "metacognitively, motivationally, and behaviorally active participants in their own learning process" (Zimmerman, 1986, p. 308). Self-regulated learners benefit from being intrinsically motivated to learn and from acting strategically in terms of how they should learn (Nakata, 2010). A learner's degree of self-regulation strongly affects the likelihood of his/her academic success (Zimmerman, 2002; 2008). The SRL framework

helps us to understand the joint influence of motivational factors and learning strategies on learning.

Given that target-language input, output, and interaction opportunities are heavily restricted in foreign-language learning contexts, the learning of vast numbers of words arguably requires learners to be motivated and to make effective use of various strategies (Tseng & Schmitt, 2008). SRL can thus help to answer the remaining questions about the mechanisms whereby learners regulate their motivation and learning strategies in L2 vocabulary learning. While it is critical that we understand why students learn L2 vocabulary (e.g., motivated learning of words) and how they actually do so (e.g., strategic processes of learning words), it is probably even more important to explore how these 'why' and 'how' factors work together.

Following a review of studies that have examined the separate relationships between learning strategies and motivation (and its sub-types) in L2-learning contexts, we focus specifically on the small amount of research that has studied these factors' influences on L2 learning within integrated frameworks.

Language-learning strategies in L2 learning

Learning strategies, comprising both behavioral and mental steps taken by the learners (Oxford, 1990), have been recognized as an essential part of L2 learning in general, and L2 vocabulary learning in particular (Gu & Johnson, 1996; Oxford, 1990; O'Malley & Chamot, 1990). Broadly speaking, learning strategies can be classified as either cognitive or metacognitive, with the former including the use of skills to process learning content (e.g., rehearsal, elaboration, organization), and the latter referring to the control and regulation of one's cognition (e.g., setting goals, monitoring progress,

adjusting learning speed; see Pintrich, Smith, García, & McKeachie, 1993). Students' personalized learning strategies have been found to explain a high proportion of their L2 vocabulary-learning activities (d=.48; see Tseng & Schmidt, 2008).

Prior studies exhibit a high degree of consensus that the use of language-learning strategies and L2 achievement are positively associated (Lai, 2009; Lan & Oxford, 2003; Magogwe & Oliver, 2007; Mezei, 2008; Vandergrift, 2003; Wang, Spencer, & Xing, 2009; Wharton, 2000; Zhang & Goh, 2006). Wharton (2000), for example, found using ANOVA tests that students who self-rated their proficiency as good or fair used more learning strategies than students with poor proficiency self-ratings ($p < .05$; F was not reported). Similarly, Lai (2009) found that students with high English proficiency used all language-learning strategies more frequently than those whose proficiency was intermediate ($\beta = 0.90$) or low ($\beta = 1.48$). Mezei's (2008) case study of two successful language learners concluded that self-regulatory capacity operates as a function of language proficiency, and specifically, that high-level L2 learners were aware of and able to regulate the processes of their own learning.

A similar close relationship between use of learning strategies and general L2 proficiency has also been confirmed in the specific sphere of L2 vocabulary learning (Barcroft, 2009; Fan, 2003; Gu & Johnson, 1996; Mizumoto, 2010). For example, Gu and Johnson's (1996) classified the vocabulary-learning strategies used by Chinese EFL learners as either cognitive (e.g., guessing, dictionary use) or metacognitive (e.g., selective attention, self-initiation), and reported that a person's preference for cognitive or metacognitive learning strategies predicted his/her vocabulary size and performance on a standardized English proficiency test, with small effect sizes. Barcroft (2009) found that

two cognitive strategies frequently used by Spanish learners – mnemonics and L2-picture association – were both positively correlated with vocabulary recall rate, again with small effect sizes.

Motivation in L2 learning

While the use of language-learning strategies has a positive impact on learning outcomes, it seems unlikely that L2 learners would adopt such strategies if they were not motivated to learn (Dörnyei, 1998). Indeed, motivation is widely acknowledged as a significant factor in L2 learning (Gardner, 1985; Gardner & Lambert, 1972).

One of a number of psychological theories of motivation, Deci and Ryan's (1985; 1995) Self-Determination Theory (SDT) defines individual motivation as the degree of autonomy that individuals exhibit during learning activity, and subdivides it into two motivational orientations. *Intrinsic motivation* refers to doing something because satisfaction is inherent in the process, while *extrinsic motivation* refers to doing something in order to attain outcomes external to it. Vallieres (1992) further subdivided intrinsic motivation into *intrinsic motivation-knowledge*, in which the learner's pleasure or satisfaction is derived from exploring or understanding new information; *intrinsic motivation-accomplishment*, based on the achievement of specific learning goals; and *intrinsic motivation-stimulation*, associated with sensations derived from learning activities, including what might be described as a "mental buzz". For Deci and Ryan (1985), extrinsic motivation also has three subtypes, along a continuum based on the degree of autonomy. *External regulation* is its least autonomous form, with learning regulated through external rewards or punishments. *Introjected regulation* refers to a middle ground in which learning behaviors are internalized by the individual to some

degree, but fall short of being truly or fully self-determined. Lastly, *identified regulation* refers to the internalization of a person's extrinsic motivation through their identification of the importance or value of the learning tasks.

Intrinsic motivation and language learning

A large body of empirical research in the field of L2 acquisition has examined the relationship between intrinsic motivation and language achievement. Taken as a whole, this literature supports a positive effect of intrinsic motivation on language learning. A series of studies by Noels and her colleagues in Canadian contexts, for example, found that intrinsic motivation was an important indicator of students' motivational intensity, persistence, and final grades, with a small to medium effect size (Noels, Clément, Pelletier, 2001; Noels, Pelletier, & Vallerand, 2000). Studies in other learning contexts reported similar findings (e.g., Pae, 2008; Wen, 1997).

Extrinsic motivation and language learning

There is no similar consensus on the relationship between extrinsic motivation and L2 learning, with some studies reporting a negative relationship (e.g., Noels et al., 2001; Pae, 2008; Shaikholeslami & Khayyer, 2006; Wang, 2008), and others against such a negative association (Liu, 2007; Wang, 2008). Moreover, correlations between extrinsic and intrinsic motivation may be positive and strong (Gonzales, 2011; Lin, McKeachie, & Kim, 2003; Vandergrift, 2005), rendering extrinsic motivation's unique value difficult to isolate. Mezei (2008) found it likely that intrinsic and extrinsic motivation could coexist in an individual.

Motivation in L2 vocabulary learning

Despite the strong interest in motivation among L2 researchers, very few studies have examined motivation's effects on vocabulary learning. Of these, Zheng (2012) confirmed the fundamental role of motivation in L2 vocabulary learning among a sample of Chinese EFL college students; and Fontecha and Gallego (2012) reported a positive relationship between motivation and L2 Spanish vocabulary knowledge. Neither author differentiated between intrinsic and extrinsic motivation, however; and consequently, how these two types of motivation might be differentially related to L2 vocabulary knowledge remains unclear.

Relationships among motivation, strategy, and L2 vocabulary

From an SRL perspective, motivation and learning strategies are closely related, as motivational factors are prerequisites for self-regulated learning (Ryan & Deci, 2000). Motivated students regulate their learning actively via cognitive and metacognitive learning strategies, which suggests that such strategies mediate the effect of motivation on learning outcomes (Pintrich & De Groot, 1990).

The combined effect of motivation and learning strategies on achievement has been extensively documented in non-L2 research (e.g., Law, 2009; Logan, Medford, Hughes, 2011), but only a handful of studies have explored this effect in L2 learning. Tsuda and Nakata (2013), for example, confirmed that metacognitive strategy, cognitive strategy, and motivation were important components of self-regulated EFL learning. Similarly, Van Aacken (1999) showed that the combination of metacognitive learning strategies and a positive attitude affected kanji learning outcomes; and Kormos and Csizér (2014) documented how self-regulated learning strategies mediated the effect of motivational factors on autonomous learning behavior – specifically, that strong

motivation was a prerequisite for the adoption of self-regulated learning strategies, which in turn predicted students' autonomous learning. A limitation of Kormos and Csizér's study was that the three strategies it examined (opportunity control, time management, and satiation control) were not specific to language learning. It therefore remains unclear whether language-learning strategies, either cognitive or metacognitive, would mediate the learning process in a similar way.

So far, few studies have even cursorily investigated the self-regulated learning process in L2 vocabulary learning. Tseng and Schmitt (2008) took an initial step in this direction, presenting a model using structural equation modeling (SEM) that highlighted the importance of motivation as a direct influence on self-regulation capacity in vocabulary learning, and the use of learning strategies as contingent upon motivation. However, they did not identify a direct impact of motivation on the use of learning strategies, which seems to conflict with previous studies' findings (Vandergrift, 2005; Wang, Peng, Huang, Hou, & Wang, 2008); and it remains unclear to us whether the impact of extrinsic motivation on vocabulary knowledge is mediated in a similar manner to the impact of intrinsic motivation.

The present study

To address the gaps in the existing literature described in the previous sections, this study aimed to answer the following questions:

1. What are the relationships among motivation, learning strategies, and vocabulary knowledge for Chinese EFL learners? Do learning strategies mediate the relationship between motivation and vocabulary knowledge?

2. Do intrinsic motivation and extrinsic motivation function differentially with respect to their relationships with learning strategies and vocabulary knowledge?

Method

Context

This study was conducted in a top urban high school in eastern China, where students are believed to have higher SES than high-school populations in other parts of the country. Students' exposure to English varied on a daily basis (between 40 and 80 minutes), but in the aggregate, it was the same across all the classes. On average, these foreign-language learners spent at least 10 hours learning English every week.

Participants

Our participants were 107 students (68 females, 39 males) in 10th grade, the first year of secondary school in China, drawn from two randomly selected classes. Their average age was 15.83 (*SD* = .55), and none had any study-abroad experience. The average duration of the participants' formal English education was 8.70 years (*SD* = 1.92).

Instruments

Our three instruments included two questionnaires, one that surveyed the participants' motivation and the other, their strategies for English-vocabulary learning, and a test that measured their vocabulary breadth. All questionnaire items were presented to the participants in both English and Chinese. The questionnaires were adapted from various sources in English, which the lead author, a native Chinese speaker, translated into Chinese. The translation was then verified by two Chinese faculty members at the

school where the research was conducted. All instruments were administered in the participants' classrooms at the end of their first year of high school.

Intrinsic and Extrinsic Motivation

Our measures of intrinsic and extrinsic motivation, based on the Language Learning Orientations Scale (Noels et al., 2000), included 17 self-report items (see Table 1). Participants rated the extent to which they agreed with each of these statements on a 7-point Likert scale, ranging from 1 (*not at all true of me*) to 7 (*very true of me*). Table 1 presents descriptive statistics and sample items from each of the instruments. The intrinsic motivation section (9 items, composite reliability = .90) contained three three-item subsections: knowledge, accomplishment, and stimulation (see Table 1 for internal reliability). Extrinsic motivation (8 items, composite reliability = .78) included three subsections: external regulation, introjected regulation, and identified regulation (see Table 1). The composite reliability of the latent variable motivation was .85.

Vocabulary-learning strategies

Based on the literature (Barcroft, 2009; Gu & Johnson, 1996), we categorized vocabulary-learning strategies into cognitive and metacognitive types. Students' self-reported use of cognitive and metacognitive vocabulary-learning strategies was elicited using a 7-point Likert scale, again ranging from 1 (*not at all true of me*) to 7 (*very true of me*). The cognitive part of the questionnaire was adopted from the Vocabulary Learning Questionnaire, Version 3 (VLQ3) developed by Gu and Johnson (1996), and included guessing, dictionary use, note-taking, memorization, and activation. A sample cognitive-strategy item was, "I make use of context when guessing the meaning of a word." The α of these 35 items was .94, indicating high reliability.

The metacognitive part of the questionnaire was adapted from the VLQ3, the Strategic Vocabulary Learning Involvement Questionnaire (Tseng & Schmitt, 2008), and the Motivated Strategies for Learning Questionnaire (Pintrich et al., 1993). It contained 14 items (e.g., "I think about how to improve my learning of words"), with $\alpha = .90$. The composite reliability of the latent variable learning strategies was .93.

Vocabulary Knowledge

Vocabulary knowledge was measured using the Vocabulary Levels Test (VLT; Nation, 1983, as modified by Schmitt, Schmitt, & Clapham, 2001), which was designed to estimate the English-vocabulary sizes of L2 learners. This study adopted three levels – 2,000, 3,000, and 5,000 words – as the 10,000-word level seemed likely to be far beyond the English proficiency of Chinese 10th graders. Each item contained six sets of six English words and three Chinese definitions. The participants were asked to choose the most appropriate word from each six-word list to match each of the three associated definitions. For example, they were given *business*, *clock*, *horse*, *pencil*, *shoe*, and *wall*, and asked to match them to *part of a house*, *animal with four legs*, and *something used for writing*. They were awarded one point for each correct answer, and zero for incorrect matches. The maximum score for vocabulary knowledge was therefore 54, and the minimum zero. The result of KR20 was .93.

Data Analysis

To answer our research questions, we adopted SEM: a multivariate statistical analysis capable of revealing the multiple and complex relationships among observed and/or latent variables, under a hypothesized theoretical model, with the goal of establishing the extent to which the hypothesized model is supported by the response data

(Schumacker & Lomax, 2010). The data and descriptive statistics were managed using Stata 13 software, and SEM was performed using AMOS 21.

Results

Descriptive statistics

Table 1 presents the means, standard deviations, and Cronbach's α reliability coefficients for each of the observed variables. Intrinsic motivation (IM) and extrinsic motivation (EM) were composite scores, averaged from their indicators. IM, EM, and the measured variable of knowledge (including accomplishment, stimulation, external regulation, introjected regulation, identified regulation, metacognitive strategy, and cognitive strategy) were all above the midpoint of the 7-point Likert scale. The average vocabulary-knowledge score (i.e., 21.74) was below the midpoint of the scale (i.e., 54 points). The variables were normally distributed, as skewness was between -1 and 1 (Bulmer, 1979), and the reliabilities of all observed variables ranged from .63 to .94, suggesting acceptable reliabilities.

[Insert Table 1 here]

Contributions of motivation and learning strategies to vocabulary knowledge

To answer our first research question, regarding the overall impact of motivation and vocabulary-learning strategies on vocabulary knowledge, we conducted SEM to test the relationships between these three factors. The model was a good fit for the data in this study, if compared to the saturated model, with $x^2(3) = 1.722$ ($p > .05$), CFI = 1.000, and RMSEA = .000 with a 90% confidence interval of .000 to .132 (see Table 2). Both IM

(β = 1.09)[1] and EM (β = .69, p < .001) loaded significantly on the latent variable of motivation, and both metacognitive (β = .95) and cognitive strategies (β = .92, p < .001) loaded significantly on the latent variable of vocabulary-learning strategies.

[Insert Table 2 here]

Previous findings about the possible mediating role of learning strategies in self-regulated learning (Pintrich & De Groot, 1990) led us to hypothesize that both motivation and learning strategies predicted vocabulary knowledge, and that learning strategies might also mediate the effect of motivation on vocabulary knowledge (see Table 3). Motivation had a significantly positive effect on both vocabulary knowledge (β = .18, p < .05) and learning strategies (β = .68, p < .001). Learning strategies had a significantly positive effect on vocabulary knowledge (β = .59, p < .001). Motivation explained 46% of the variance in learning strategies, and motivation together with learning strategies explained 52% of the total variance in vocabulary knowledge.

We then tested the mediation by learning strategies of the effect of motivation on vocabulary knowledge, using bootstrapping procedures (see Figure 1). Unstandardized indirect effects were computed for each of 10,000 bootstrapped samples, and the bootstrapped unstandardized indirect effect was found to be statistically significant (p < .001), with bias-corrected 95% confidence intervals ranging from 1.86 to 4.60. The unstandardized indirect effect of motivation on vocabulary knowledge through learning strategies was 2.96. After controlling for learning strategies, the direct effect of motivation on vocabulary knowledge was also significant (B = 1.31, p < .05). Therefore,

[1] Please refer to Jöreskog (1999) for why a standardized coefficient could be larger than 1. http://www.ssicentral.com/lisrel/techdocs/HowLargeCanaStandardizedCoefficientbe.pdf

the effects of motivation on vocabulary knowledge were partially mediated by learning strategies, with both direct and indirect effects being significant.

[Insert Table 3 and Figure 1 here]

Contributions of different types of motivation to vocabulary knowledge

We next sought to establish whether IM and EM functioned the same way as each other in the process of vocabulary learning. We therefore conducted two additional SEM models to test (1) the influence of IM and learning strategies on vocabulary knowledge, and (2) the influence of EM and learning strategies on vocabulary knowledge.

The first of these models showed a good fit, with $x^2(7) = 10.461$ ($p > .05$), CFI = .993, and RMSEA = .068 (90% confidence interval .000 to .148). The Model 2 section of Table 2 presents the standardized coefficients of the measurement model. Knowledge, stimulation, and accomplishment all loaded well on IM, with factor loadings of .92, .83, and .84 respectively. Cognitive and metacognitive learning strategies ($\beta = .95$) also loaded well on the latent factor of learning strategies, with factor loadings of .92 and .95, respectively.

As shown in Table 4, IM had a significantly positive effect on learning strategies ($\beta = .79$, $p < .001$), explaining approximately 62% of the total variance. Learning strategies had a significantly positive effect on vocabulary knowledge ($\beta = .50$, $p < .001$). Around 53% of the total variance in vocabulary knowledge was accounted for by IM and learning strategies. The bootstrapped unstandardized indirect effect of IM on vocabulary knowledge through learning strategies was significant and positive ($B = 3.30$, $p < .001$), with the bias-corrected 95% confidence interval ranging from 1.62 to 5.37; and the direct effect of IM on vocabulary knowledge was also significant and positive ($B = 2.25$, p

< .05). In parallel to the results of the first research question, IM positively affected vocabulary knowledge both indirectly and directly (see Figure 2).

[Insert Table 4 and Figure 2 here]

A similar structural model constructed to test the relationships among EM, learning strategies, and vocabulary knowledge (see the Model 3 section of Table 2) showed a good fit, $x^2(7) = 13.657$ ($p > .05$), CFI = .980, and RMSEA = .095 (90% confidence interval .000 to .169). All the indicators of EM loaded significantly (external regulation $\beta = .53$; introjected regulation $\beta = .99$, $p < .001$; and identified regulation $\beta = .65$, $p < .001$). Metacognitive and cognitive learning strategies also showed significant loadings on the latent factor of learning strategies (metacognitive $\beta = .94$; cognitive $\beta = .93$, $p < .001$).

EM had a significantly positive effect on learning strategies ($\beta = .48$, $p < .001$) and accounted for 23% of their total variance (see Table 5). Learning strategies positively predicted vocabulary knowledge ($\beta = .63$, $p < .001$), and learning strategies together with EM explained 52% of the total variance in our respondents' vocabulary knowledge. Bootstrapping showed that the unstandardized indirect effect of EM on vocabulary knowledge through learning strategies was significant ($B = 4.66$, $p < .001$), with the bias-corrected 95% confidence interval ranging from 2.07 to 11.06. The direct effect of EM on vocabulary knowledge, however, was not significant ($B = 2.51$, $p = .051$). Thus, learning strategies can be said to have fully mediated the positive effect of EM on vocabulary knowledge (see Figure 3).

[Insert Table 5 and Figure 3 here]

Discussion

Our research yielded three major findings: (1) that learning strategies played a mediating role in the effect of motivation on L2 vocabulary learning; (2) that there was a positive, unique effect (and partial mediation effect) of IM on vocabulary knowledge; and (3) that there was no unique effect, but a full mediation effect, of EM on vocabulary knowledge.

Mediation role of learning strategies

Our results show that L2 learners' motivation affected vocabulary learning through either full or partial mediation of cognitive and metacognitive learning strategies. This supports theorists' consensus that SRL mediates the relationship between students' motivational variables and their academic performance (Lens & Vansteenkiste, 2012; Pintrich, 2000; Zimmerman, 2008). Learning strategies' mediating role between motivation and academic achievement has mainly been reported in the sciences (Pintrich & De Groot, 1990), general-education courses (Khatib, 2010; Walker, Greene & Mansell, 2006), and L1 studies (Law, 2009; Logan et al., 2011), and our findings extend this to L2 vocabulary learning.

More importantly, our findings shed new light on the relationship between motivation, learning strategy and learning performance in L2 vocabulary learning. Although this mediating mechanism had previously been identified (Tseng & Schmitt, 2008), our study found that both IM and EM played distinct roles in it. We believe that vocabulary learning is a proactive process that includes both how a person is motivated to learn vocabulary, and an active and complex use of cognitive or metacognitive vocabulary-learning strategies. Students who were motivated to learn vocabulary, either intrinsically or extrinsically, used various such strategies; and this was critical to the

transformation of their learning-related desires and goals into actual L2 vocabulary-learning performance. Such strategy use is critical to the transformation of their learning-related desires and goals into actual L2 vocabulary-learning performance.

Contribution of intrinsic motivation

The paths by which, and the extent to which, learning strategies mediated the impacts of IM and EM on vocabulary knowledge were different. Uniquely, IM positively predicted vocabulary knowledge both directly and indirectly. This is consistent with self-determination theory, which recognizes (1) IM as a fundamental component of L2 learning (e.g., Noels et al., 1999; Pae, 2008; Wang, 2008); (2) the possible role of learning-strategy use as a mediator in SRL (e.g., Kormos & Csizer, 2014); and (3) the positive effect of IM on vocabulary learning (Tseng & Schmitt, 2008). Based on our findings, we believe that intrinsic motivation has a unique impact on vocabulary-knowledge acquisition. Learners need to have autonomous intrinsic motivation to use various learning strategies. Students who are intrinsically motivated understand what it means to learn; actively seek out useful resources that could help with their learning; manage the pace of their own learning; and take pleasure in meeting challenges and solving problems that arise as part of the learning process (Reeve, Ryan, Deci, & Jang, 2012).

Contribution of extrinsic motivation

Our finding of a significant role of EM in L2 vocabulary learning raises the possibility that EM may support (via active use of various learning strategies) both initiation of and persistence in L2 study – at least in the unique context of the L2-learning environment in China. Specifically, the growing Chinese economy has resulted in an

increasing need for people with competitive English proficiency (Liu, 2007), and the Chinese cultural emphasis on exams and grades as the basis of lifelong success, along with praise for high scores (Chen, Warden, & Chang, 2005; Liu, 2007; Roskams, 1999), would tend to lead to high levels of EM, as well as the positive impact of EM on students' active use of strategies that we observed.

Individuals' autonomy may vary according to the contexts they are embedded in (Deci & Ryan, 2012). This may explain the discrepancies between our findings regarding the effects of EM and those of previous L2 studies: for example, Noels et al.'s (2001), which reported no significant relationship between EM and course achievement among learners of L2 Spanish. However, Noels et al.'s study was conducted in California, which has a large Spanish-speaking population and where the purpose of L2 learning might be effective communication with others in the community, rather than simply getting a good course grade or a good job: a strong contrast to the Chinese context for English learning of our own research. Indeed, the positive impact of EM points to how motivational influences on L2 learning achievement may be sensitive to nuanced contextual variations. We suggest that future research pay close attention to these nuances, instead of jumping to conclusions about EM's overall effects based on the findings of research on non-L2 domains or on one or two specific L2 or foreign-language contexts.

Apart from finding that extrinsic motivation may not necessarily stifle learning, at least among Chinese EFL learners, we found that it indeed influenced L2 vocabulary performance through the effects of strategy use. The pattern of this relationship, however, differs from that identified in a previous study of college students (Walker et al., 2006),

which found that extrinsic motivation only predicted a shallow cognitive learning strategy (memorization), and not meaningful ones.

There are three possible explanations for these different results. First, the divergence may have arisen from the operational definition of shallow cognitive engagement used by Walker et al. (2006), which mainly consisted of the use of memorization. Our study, in contrast, did not differentiate between deep and shallow strategies, nor did we treat memorization as an inferior type of strategy. As Gu (2003) pointed out, repeating a new word is the first and easiest strategy people tend to use to remember it, and the Inventory of Vocabulary Learning Strategy (Gu & Johnson, 1996) included rehearsal as a subscale of cognitive vocabulary-learning strategy. A second reason may reside in the domain variance between these two studies. Walker et al. (2006) examined students' extrinsic motivation and strategy use in two college-level classes (i.e., Educational Psychology and Career Exploration), while our focus was high school students' L2 vocabulary performance. For our participants, English-learning performance was critical to their academic success in high school, whereas it is possible that the two courses in Walker et al. 's (2006) study were not considered to be high-stakes. If so, students' extrinsic motivation to learn in these two courses might not necessarily have lead to an active use of learning strategy. Lastly, the unique L2 learning context in China (as discussed above) might also have contributed to the different findings.

Several limitations of the current study need to be noted. First, we used vocabulary size as the only indicator of students' vocabulary knowledge. Vocabulary depth has often been taken into consideration (e.g., Schmitt, 2008), and while it is highly correlated to vocabulary size, and may even be inseparable from it (Farvardin & Koosha,

2011), there may be as-yet-undiscovered differences between these two dimensions when it comes to their relationship(s) with SRL. Second, instead of using Relative Autonomy Index (RAI) to calculate the composite score for motivations on the self-determination continuum, we loaded IM and EM on a latent variable because of their high and positive correlation. Further exploration of RAI in vocabulary learning and other domains of EFL learning among Chinese-speaking students is warranted. Third, our sample is small for SEM analysis. Though a recent simulation study (Sideridis, Simos, Papanicolaou, & Fletcher, 2014) of a five-latent-variable model suggested that a group of 70 to 80 participants could yield satisfactory model fit, larger sample sizes are desirable if future research is to confirm our findings. Lastly, our Chinese questionnaires were adapted from English ones, and it was the first time that they were administered in the Chinese language. We did not have a pilot study to validate this adaptation, though the measurement part showed a satisfactory factor structure in all SEM models. Two measures, external regulation (α = .64) and identified regulation (α = .63), showed lower reliability than the .75 and .84 reported by Noels et al. (2000), and this should be considered a limitation of the present study.

This study represents the first attempt to examine the structural relationships between motivation and learning strategies in the learning of foreign vocabulary. We suggest that future L2 researchers replicate this study to examine the generalizability of our findings to different social and cultural contexts, different age groups, and different domains within L2 learning. We also recommend that researchers engage in rigorous analysis of the relationships among motivational variables, strategy use, and L2 achievement. Last not but least, given the uniqueness of learners' individual

characteristics, we propose that future studies include more such characteristics to examine whether they are associated with variation in vocabulary-learning performance.

Conclusion

Theoretically, the present study's findings considerably enrich our knowledge about L2 SRL, particularly with respect to the combined role of IM and EM. Pedagogically, awareness of the complexity of the construct "motivation" will help educators more clearly understand what actually drives students to learn foreign-language vocabulary. In addition, since students' motivation and their use of learning strategies both predict vocabulary knowledge, teachers should take these psychological and cognitive dimensions of students' characteristics into consideration, as distinct from the teaching of content knowledge. It is important for educators to keep encouraging students to see vocabulary learning as an enjoyable process, in order to increase their intrinsic motivation for life-long language learning.

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Table 1. Means, Standard Deviations, Internal Reliability, and Sample Items for Observed Variables (N = 107)

	Mean (SD)	α	Skewness (SE)	Kurtosis (SE)	Sample Item
VK	21.74 (11.38)	-	.93 (.23)	.85 (.46)	-
IM	4.43 (1.41)	-			-
KNOW	4.53 (1.47)	.80	-.33 (.23)	-.33 (.46)	I learn vocabulary for the pleasure I experience in learning words.
ACCOM	4.49 (1.50)	.81	-.23 (.23)	-.57 (.46)	I learn vocabulary for the satisfied feeling I get when I master difficult words.
STIMU	4.29 (1.66)	.79	-.18 (.23)	-.87 (.46)	I learn vocabulary for the pleasure I get from recognizing the English words around me.
EM	4.51 (1.21)	-			
EXTER	4.93 (1.38)	.64	-.51 (.23)	-.22 (.46)	I learn vocabulary in order to get high scores on exams.
INTRO	4.07 (1.45)	.73	-.19 (.23)	-.74 (.46)	I learn vocabulary because I would feel bad if I had little knowledge of it.
IDEN	4.51 (1.64)	.63	-.26 (.23)	-.69 (.46)	I learn vocabulary because I want to be the kind of person who knows many words.
METACOG	3.90 (1.14)	.94	.27 (.23)	-.72 (.46)	I think about how to improve my learning of words.
COG	3.99 (1.13)	.90	.13 (.23)	-.74 (.46)	I make use of context when guessing the meaning of a word.

Note. VK = vocabulary size; IM = intrinsic motivation; KNOW = knowledge; ACCOM = accomplishment; STIMU = stimulation; EM = extrinsic motivation; EXTER = external regulation; INTRO = introjected regulation; IDEN = identified regulation; METACOG = metacognitive strategy; COG = cognitive strategy.

Table 2. Standardized Path Coefficients of the Measurement Models ($N = 107$)

		β	p
Model 1	MOT		
	IM	1.09	-
	EM	.69	< .001
	STR		
	METACOG	.95	-
	COG	.92	< .001
Model 2	IM		
	KNOW	.92	-
	STIMU	.83	< .001
	ACCOM	.84	< .001
	STR		
	METACOG	.95	-
	COG	.92	< .001
Model 3	EM		
	EXTER	.53	-
	INTRO	.99	< .001
	IDEN	.65	< .001
	STR		
	METACOG	.94	-
	COG	.93	< .001

Note. MOT = latent variable of motivation; STR = latent variable of learning strategies; IM = latent variable of intrinsic motivation; KNOW = knowledge; ACCOM = accomplishment; STIMU = stimulation; EM = latent variable of extrinsic motivation; EXTER = external regulation; INTRO = introjected regulation; IDEN = identified regulation; METACOG = metacognitive strategy; COG = cognitive strategy.

Table 3. Path Coefficients of Motivation and Learning strategies on Vocabulary Knowledge (*N*=107)

				Unstandardized Bias-corrected Bootstrap 95%CI	
	β (S. E.)	*B*(S.E.)	*p*	Lower	Upper
Total effects					
MOT -> STR	.68(.07)	.46(.08)	< .001	.31	.61
STR -> VK	.59(.09)	6.46(1.26)	< .001	3.97	8.94
MOT -> VK	.57(.06)	4.27(.80)	< .001	2.66	5.83
Direct effects					
MOT -> STR	.68(.07)	46(.08)	< .001	.31	.61
STR -> VK	.59(.09)	6.46(1.26)	< .001	3.97	8.94
MOT -> VK	.18(.09)	1.31(.67)	.018	.21	2.85
Indirect effects					
MOT -> VK	.40(.07)	2.96(.67)	< .001	1.86	4.60

Note. MOT = latent variable of motivation; STR = latent variable of learning strategies; VK = vocabulary knowledge.

Table 4. Path Coefficients of Intrinsic Motivation and Learning strategies on Vocabulary Knowledge (*N*=107)

				Unstandardized Bias-corrected Bootstrap 95%CI	
	β (S. E.)	*B*(S.E.)	*p*	Lower	Upper
Total effects					
IM -> STR	.79(.05)	.63(.06)	< .001	.53	.76
STR -> VK	.50(.12)	5.20(1.43)	< .001	2.50	8.17
IM -> VK	.66(.05)	5.55(.84)	< .001	4.09	7.37
Direct effects					
IM -> STR	.79(.05)	.63(.06)	< .001	.53	.76
STR -> VK	.50(.12)	5.20(1.43)	< .001	2.50	8.17
IM -> VK	.27(.12)	2.25(1.06)	.037	.14	4.41
Indirect effects					
IM -> VK	.39(.10)	3.30(.95)	< .001	1.62	5.37

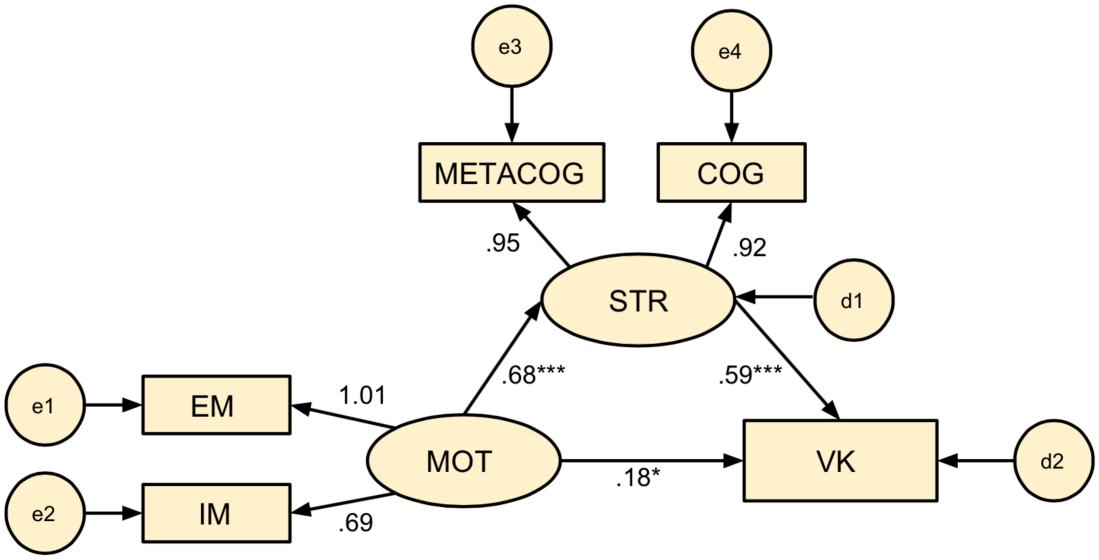
Note. STR = latent variable of learning strategies; IM = latent variable of intrinsic motivation; VK = vocabulary knowledge.

Table 5. Path Coefficients of Extrinsic Motivation and Learning strategies on Vocabulary Knowledge (*N*=107)

				Unstandardized Bias-corrected Bootstrap 95%CI	
	β (S. E.)	*B*(S.E.)	*p*	Lower	Upper
Total effects					
EM -> STR	.48(.13)	.70(.42)	< .001	.34	1.59
STR -> VK	.63(.08)	6.66(1.12)	< .001	4.47	8.85
EM -> VK	.47(.09)	7.17(3.80)	< .001	3.98	14.92
Direct effects					
EM -> STR	.48(.13)	.70(.42)	< .001	.34	1.59
STR -> VK	.63(.08)	6.66(1.12)	< .001	4.47	8.85
EM -> VK	.16(.08)	2.51(1.89)	.051	-.02	6.46
Indirect effects					
EM -> VK	.30(.09)	4.66(2.86)	< .001	2.07	11.06

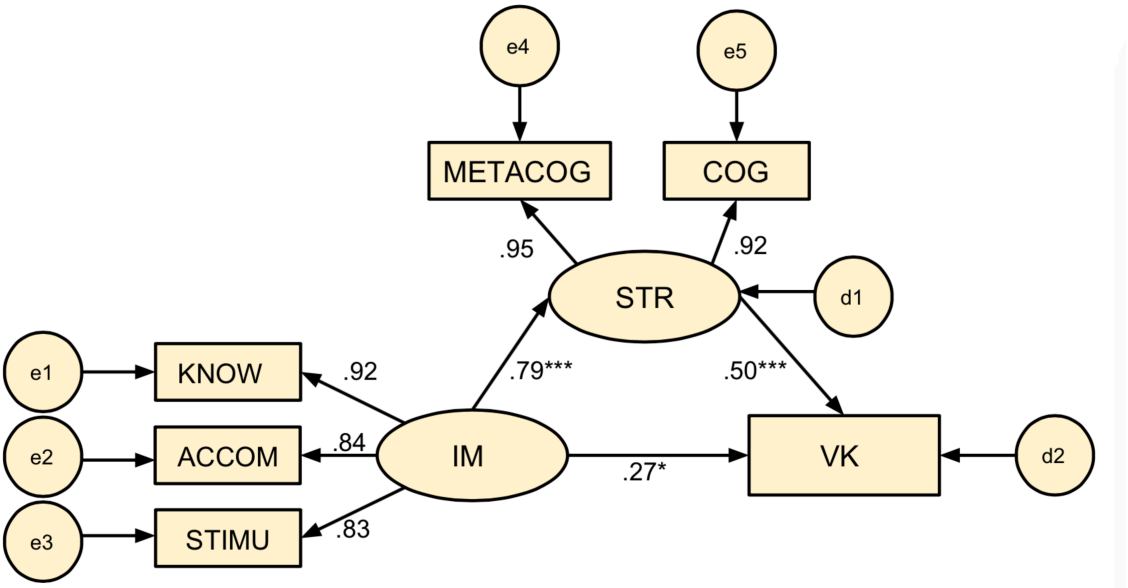
Note. STR = latent variable of learning strategies; EM = latent variable of extrinsic motivation; VK = vocabulary knowledge.

Figure 1. Structural Model of the Relationships between Motivation, Vocabulary-learning Strategies, and Vocabulary Knowledge



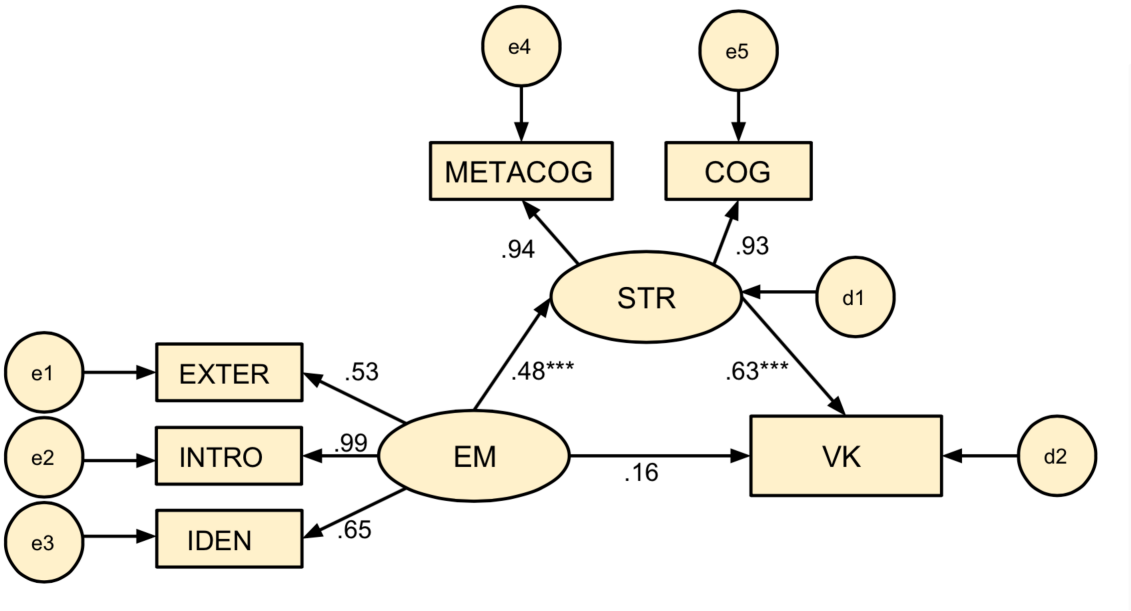
*p < .05; ***p < .001. MOT = latent variable of motivation; STR = latent variable of learning strategies; VK = vocabulary size; IM = intrinsic motivation; EM = extrinsic motivation; METACOG = metacognitive strategy; COG = cognitive strategy. $x^2(3)$ = 1.722 (p > .05), CFI = 1.000, and RMSEA = .000.

Figure 2. Structural Model of the Relationships between Intrinsic Motivation, Vocabulary-learning Strategies, and Vocabulary Knowledge



*p < .05; ***p < .001. IM = latent variable of intrinsic motivation; KNOW = knowledge; ACCOM = accomplishment; STIMU = stimulation; STR = latent variable of learning strategies; VK = vocabulary size; METACOG = metacognitive strategy; COG = cognitive strategy. $x^2(7) = 10.461$ ($p > .05$), CFI = .993, and RMSEA = .068.

Figure 3. Structural Model of the Relationships between Extrinsic Motivation, Vocabulary-learning Strategies, and Vocabulary Knowledge



***$p < .001$. EM = latent variable of extrinsic motivation; EXTER = external regulation; INTRO = introjected regulation; IDEN = identified regulation; STR = latent variable of learning strategies; VK = vocabulary size; METACOG = metacognitive strategy; COG = cognitive strategy. $x^2(7) = 13.657$ ($p > .05$), CFI = .980, and RMSEA = .095.