



Investigating the relationships between motivation, strategies and L2 vocabulary knowledge: A structural equation modelling approach

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ABSTRACT

Despite significant advancements in comprehending the various factors contributing to effective vocabulary learning, there remains a limited exploration of the interconnections among key factors involved in second language (L2) vocabulary acquisition, particularly concerning the mechanisms through which learners regulate their motivation and learning strategies. This study aimed to address this gap by investigating L2 vocabulary learning, with a specific focus on how different motivational factors and learning strategies jointly influence the vocabulary size of adult learners of English as a foreign language (EFL) in China.

The research involved 143 adult participants (70 females, 66 males) from Jilin province, China. Data was collected through two questionnaires, the first one assessing students' motivation levels in relation to English vocabulary learning and the second one examining their English vocabulary learning strategies (VLS). Additionally, a vocabulary size test was administered to measure participants' vocabulary knowledge (VK)

The findings revealed that motivation only indirectly predicted VK through the mediating effect of VLS. Further analyses indicated that intrinsic motivation (IM) and extrinsic motivation (EM) had only positive and significant indirect effects on VK, and both effects were fully mediated by VLS. However, the impact of IM on VK mediated through VLS was not as strong compared to that of EM on VK when mediated through VLS. The findings, in general, indicate that either intrinsically or extrinsically motivated learners were both likely to employ various strategies, which positively influenced VK.

The study contributes to the existing literature by advancing the understanding of the interconnectedness between motivation, VLS, and VK, which carries both theoretical implications for the field of language learning and pedagogical significance for educators seeking to enhance the effectiveness of L2 vocabulary instruction.

Keywords: motivation, strategies, L2 vocabulary, structural equation modeling, adult learners, EFL

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List of Abbreviations

ACCOM	Accomplishment
AGFI	Adjusted goodness of fit index
AMOS	Analysis of Moment Structures
AMS	Academic Motivation Scale
AVE	Average Variance Extracted
AWL	Academic Word List
CFA	Confirmatory factor analysis
CFI	Comparative fit index
COG	Cognitive strategies
CR	Composite Reliability
CUREC	Central University of Oxford Ethical Research Committee
DET	Determination strategies
EFA	Exploratory factor analysis
EFL	English as a foreign language
EM	Extrinsic motivation
EMI	English-medium instruction
EXTER	External regulation
GFI	Goodness of fit index
IDEN	Identified regulation
IFI	Incremental fit index
IM	Intrinsic motivation
INTRO	Introjected regulation
KNOW	Knowledge
LLOS	Language Learning Orientations Scale
LLS	Language learning strategy
L1/L2	First/Second language
L2MSS	L2 motivational self system
MEM	Memory strategies
MET	Metacognitive strategies
NFI	Normal fit index
RMSEA	Root mean square error of approximation
SDT	Self-determination theory
SEM	Structural equation modeling
SES	Socio-economic status
SILL	Strategy Inventory Language Learning
SOC	Social strategies
SRL	Self-regulated learning
STIMU	Stimulation
TLI	Tucker-Lewis index
VK	Vocabulary knowledge
VLS	Vocabulary learning strategy
VLSS	Vocabulary Learning Strategies Survey
VLT	Vocabulary Levels Test

CHAPTER 1. Introduction

This chapter presents the background information pertaining to the present investigation, followed by the objective of the study in section 1.2. Section 1.3 expounds on the significance of the study. Self-regulated learning (SRL), as a theoretical framework is elucidated in section 1.4. To facilitate readers in obtaining a comprehensive understanding of the narrative structure, this chapter concludes with an overview of the dissertation.

1.1 Background

The significance of vocabulary knowledge (VK) in the process of learning a second language (L2) has been extensively documented (Schmitt, 2008). Building upon the empirical evidence, some researchers have directed their efforts towards identifying ways to enhance L2 learners' VK by offering diverse instruction or support (e.g., Lee, Warschauer & Lee, 2019; Laufer, 2009). Others have dedicated their research to elucidating the factors contributing to variations in VK among language learners, either examining the role of motivation (e.g., Fontecha & Gallego, 2012; Zheng, 2012) or identifying learning strategies as a pivotal determinant in predicting the level of success in language learning (Barcroft, 2009; Fan, 2003; Gu & Johnson, 1996; Ranalli, 2013). Despite advancements in comprehending various factors influencing the efficacy of vocabulary learning, there still exists a lack of clarity regarding the overall pattern and interrelationships of these crucial factors in this field, such as the joint influence of motivation and strategies on vocabulary learning.

Previous studies investigating the associations between language learning strategies (LLS) and various L2 skills have indicated that the utilization of strategies positively influences L2 learning outcomes (e.g., Bećirović, Brdarević-Čeljo & Polz, 2021; Macaro, 2001; Yu, 2019). Research on L2 vocabulary has delved deeper into this relationship by examining the specific strategies or combinations of strategies employed by successful learners to expand their L2 vocabulary (e.g., Gu & Johnson, 1996; Kojic-Sabo & Lightbown, 1999; Moir & Nation, 2002; Zhang & Lu, 2015). In addition to LLS, researchers have also focused on the role of motivation in L2 vocabulary learning. Given that motivation is widely recognized as one of the key factors influencing L2 learning (Csizér, 2019), several studies have specifically investigated the relationship between motivation and L2 VK (e.g., Alamer, 2022;

Fontecha & Gallego, 2012). The findings of these studies suggest a strong association between the two constructs.

Despite the growing interest, there have been relatively few endeavors to investigate the relationships between these two essential learner factors (i.e., motivation and learning strategies) and their impact on VK. Furthermore, previous studies conducted in this domain have been subject to certain limitations. First, they have primarily focused on examining either VLS (e.g., Zhang & Lu, 2015) or motivation (e.g., Fontecha & Gallego, 2012) in relation to VK. Nevertheless, it is worth considering the examination of these variables in conjunction with each other, given the proposition that motivated learners are inclined to employ a greater range of strategies to enhance their L2 learning (Lou & Noels, 2019). This proposition has received empirical support from a few recent studies conducted in the context of L2 vocabulary learning (Lee, 2020; Zhang, Lin, Zhang & Choi, 2017). Second, a considerable body of research has focused on undergraduate L2 learners (e.g., Lee, 2020; Tseng & Schmitt, 2008) and adolescents (e.g., Lee, Ahn & Lee, 2022; Zhang et al., 2017) as participants who, arguably, may demonstrate substantial disparities in motivation and learning strategies when compared to adult learners who have already graduated due to students' exposure to structured academic environments typically found in formal schooling. In contrast, adults who have completed their formal education are more frequently immersed in work environments. Lastly, it is notable that many researchers investigating Chinese L2 learners tend to concentrate predominantly on relatively developed regions such as Beijing (e.g., Gu & Johnson, 1996), Taiwan (e.g., Tseng & Schmitt, 2008) and South China (e.g., Zhang & Lu, 2015). The disparity in socio-economic status (SES) can have implications for research outcomes, as individuals from lower SES backgrounds may face limitations in accessing educational resources, including a reduced availability of books (e.g., Bradley, Corwyn, McAdoo & García, 2001), as well as potential effects on the quality and diversity of available books (e.g., Froiland, Powell, Diamond & Son, 2013; McGill-Franzen, Lanford & Adams, 2002). Consequently, these challenges can have a negative impact on the language learning abilities of individuals.

1.2 Aim of the study

In view of the limitations of some of the prior literature highlighted earlier, the primary objective of this research is to investigate the structural associations between

motivation, VLS, and L2 VK among learners of English as a foreign language (EFL). The other aim is to investigate whether the effect of EM on VK is mediated by VLS in a comparable manner to the effect of IM on VK. Unlike previous studies, which predominantly centered around the correlations between motivation, strategies and VK within younger learners, this research targets adult learners who have graduated. Furthermore, the participants are individuals who reside and work in Jilin province, which compared to areas mentioned in section 1.1, is characterized by a relatively lower SES in China.

To examine the aforementioned relationships, the study initially gathered data by administering two questionnaires to assess participants' motivation and strategies, along with a vocabulary test to evaluate their vocabulary size. Subsequently, a structural equation modeling (SEM) analysis was conducted to analyze the interrelationships among the three variables: motivation, VLS, and VK. Based on the results obtained, the study discusses the pedagogical implications.

1.3 Significance of the study

It is important to comprehend the underlying factors behind learners' acquisition of L2 vocabulary, such as their motivational factors. Equally significant is the exploration of the actual processes employed by learners, such as the strategic approaches. However, the synergistic interaction between these 'why' and 'how' factors necessitate greater scrutiny and analysis (Zhang et al., 2017). Therefore, the study establishes a structural model to explore the relationships between motivation, VLS and VK. By doing so, it seeks to provide empirical evidence to supplement the limited number of existing studies in this domain, as mentioned in section 1.1. Another significance of the study is its examination of the extent to which the conclusions drawn from previous research can be applied to older age groups (section 2.5). There exist differences between younger learners who are typically characterized by their developmental stage, cognitive abilities and educational context, and adult learners who possess different life experiences, cognitive maturity, and motivations for language learning (refer to DISCUSSION for more detailed explanation). These disparities have implications for the generalizability of findings, emphasizing the need to carefully examine and consider the unique characteristics and needs of adult learners when drawing conclusions about L2 vocabulary acquisition. Moreover, the study has selected Jilin province for convenience reasons,

which is a less developed region in Northeast China in contrast to regions mentioned in section 1.1. This chosen region has received relatively limited attention in previous investigations of a similar nature. By focusing on adults who have graduated and the specific location, the study aims to contribute to a more comprehensive understanding of L2 vocabulary learning.

1.4 Theoretical framework

The study utilizes the theoretical framework of Self Regulated Learning (SRL), which posits that self-regulated students engage in deliberate and purposeful learning practices by initiating, modifying, and maintaining their learning behaviors (Zimmerman, 2002). SRL characterizes the independent and self-directed nature through which learners internalize their beliefs and regulatory capacities into academic skills (Zimmerman, 1986, 2002, 2008), and perceives students as individuals who actively engage in their learning process, exhibiting metacognitive, motivational, and behavioral agency (Zimmerman, 1986). Self-regulated learners derive advantages from their intrinsic motivation (IM) to acquire knowledge and skills, as well as their strategic approach to determining the most effective methods for learning (Nakata, 2010). The extent to which a learner possesses self-regulatory abilities significantly influences the probability of their academic achievement (Zimmerman, 2002, 2008). The SRL framework provides a valuable framework for comprehending the combined impact of motivational factors and learning strategies on the process of learning. Considering the limited availability of target-language input, output, and interaction opportunities in foreign language-learning settings, the acquisition of a large vocabulary necessitates learners' motivation and adept utilization of diverse strategies (Tseng & Schmitt, 2008). Therefore, the application of SRL can assist in addressing the unresolved inquiries regarding how learners regulate their motivation and learning strategies in the process of L2 vocabulary learning. Within this framework of SRL, the study hypothesizes that highly motivated L2 learners are more likely to utilize a greater variety of VLS, which, consequently, would contribute to the enhancement of their L2 VK.

1.5 Overview of the dissertation

This dissertation is structured into six chapters. Following the introduction, the second chapter delves into an extensive review of existing literature. The same chapter concludes by outlining the research questions that will be addressed in the

subsequent chapters of the dissertation. The third chapter presents a detailed account of the methodology employed in this study, including research design, the participants under investigation, the instruments utilized for data collection, piloting phase, procedural details, analysis strategy, and ethical considerations. Results in relation to each research question are presented in the fourth chapter, followed by an interpretation of the results, limitations of the study and future research suggestions in the fifth chapter. In the concluding chapter, pedagogical implications are presented.

CHAPTER 2. Literature Review

The first section of this chapter provides an overview of the developmental trajectory of language learning strategies (LLS) in second language (L2) learning, with a specific emphasis on L2 vocabulary learning. Section 2.2 delves into a review of existing literature concerning motivation in L2 learning, furnishing a detailed analysis of both intrinsic motivation (IM) and extrinsic motivation (EM) and their respective relationships with L2 learning, especially L2 vocabulary learning. Section 2.3 elucidates the relationships between motivation, strategies and L2 vocabulary knowledge (VK). The reviewed literature is summarized in section 2.4. To conclude the chapter, the research questions are outlined.

2.1 LLS in L2 learning

LLS, comprising both behavioral and cognitive steps employed by learners to enhance their own learning (Oxford, 1990), have been widely acknowledged as a crucial component of L2 learning. Many scholars posit that the beginning is marked by Rubin's (1975) seminal proposition that less proficient language learners can improve by emulating good language learners (e.g., Magogwe & Oliver, 2007; Zhang & Lu, 2015). During the 1980s and 1990s, the field experienced a period of flourishing, characterized by a shift in focus towards taxonomy of strategies (e.g., Cohen, 1998; O'Malley & Chamot, 1990; Oxford, 1990). O'Malley and Chamot (1990), for instance, proposed a taxonomy consisting of three types of strategies: cognitive, metacognitive, and social/affective strategies. Concurrently, Oxford (1990) developed the multi-faceted Strategy Inventory Language Learning (SILL), which classifies LLS into six categories, including cognitive, metacognitive, mnemonic, compensatory, affective, and social strategies. SILL is acknowledged as the most widely utilized instrument for examining LLS (White, Schramm & Chamot, 2007). However, subsequent scrutiny has raised concerns regarding its ability to accurately distinguish between mnemonic strategies and cognitive strategies, given that one is a subset of the other (Dörnyei, 2005). Criticism has also been directed towards the inclusion of compensatory strategies in the SILL, as they are more closely associated with how learners utilize the language rather than how they acquire it (ibid). In addition, Dörnyei (2005) also pointed out that despite variations in the approaches taken by Oxford and O'Malley and Chamot, their respective strategy systems exhibit a high level of compatibility.

In addition to documenting and classifying LLS, another important dimension of research in this field revolves around exploring the relationship between LLS and L2 performance. Prior research has yielded substantial evidence supporting that the effective strategy choice plays a pivotal role in improving listening comprehension (Vandergrift, 2003), reading comprehension (Tse, Lin & Ng, 2022), writing (Macaro, 2001; Teng, & Huang, 2019), oral production (Macaro, 2001; Nakatani, 2005) and overall L2 proficiency (Lan & Oxford, 2003; Magogwe & Oliver, 2007). Vandergrift's (2003) investigation, as an illustration, scrutinized the utilization of listening strategies by a cohort of 36 seventh-grade students studying French, wherein it was ascertained that adept listeners exhibited the capacity to systematically coordinate a cyclic interplay of cognitive and metacognitive strategies in listening, in contrast to their less proficient counterparts. However, the findings are subject to limitations stemming from the proficiency level of the participants under investigation and the applicability of the results to interactive listening contexts may be equally limited. Another study conducted by Tse, Lin and Ng (2022) examined the relationships between self-regulated learning (SRL) strategies utilized by 2,894 bilingual primary school students and their performance on Chinese and English reading tests. The study concluded that the Chinese planning and monitoring strategies had a direct and positive impact on the performance of both Chinese and English reading tests; the English planning exerted a positive effect on English reading test performance. Nonetheless, the limitations are apparent: the self-reported questionnaire in the study centred around metacognitive strategies may introduce bias; the exclusive use of a questionnaire as the sole instrument may not capture the full complexity of self-regulated learning processes.

2.1.1 LLS in L2 vocabulary learning

Incorporating insights from research on LLS, several L2 vocabulary studies have introduced a domain-specific group of learning strategies, which refers to a diverse range of strategies employed as a component of an ongoing process of vocabulary learning (Gu & Johnson, 1996). Gu and Johnson (1996) investigated the vocabulary learning strategies (VLS) among a sample of 850 sophomore non-English majors in China. The participants were administered a vocabulary learning questionnaire to assess their usage of VLS. The researchers, based on the study, proposed a conceptual differentiation between metacognitive regulation and cognitive strategies.

The former consists of selective attention and self-initiation, while the latter includes guessing, dictionary, note-taking, rehearsal, encoding, and activation. Another significant contribution to the field is Schmitt's (1997) inventory of VLS. Drawing from Oxford's (1990) classification, Schmitt initially classified VLS into two broad groups: discovery strategies and consolidation strategies. Discovery strategies aim to ascertain the meanings of new and unfamiliar words. This category of strategies is subdivided into determination strategies (e.g., inferring the meaning of a new word based on its form or context, or consulting external resources, such as dictionaries) and social strategies (i.e., seeking assistance from others to clarify the meaning of a new word). In contrast, consolidation strategies are focused on the retention of newly introduced words, and are further divided into memory (i.e., learning vocabulary by executing manipulative mental processing), cognitive (e.g., repetition and using mechanical means such as word lists and vocabulary notebooks), metacognitive (i.e., self-regulating one's own vocabulary learning), and social strategies (e.g., learning or practicing vocabulary in collaboration with peers). Nonetheless, the categorizations of VLS and items derived from theoretical grounds in these endeavors may require further validation through statistical methods such as exploratory factor analysis (EFA) and confirmatory factor analysis (CFA; Fan, 2020).

The relationship between VLS and VK has also been extensively investigated (e.g., Fan, 2003; Gu & Johnson, 1996; Mizumoto & Takeuchi, 2009; Nassaji, 2006). Gu and Johnson's (1996) study was among the early research endeavors that provided valuable insights into the correlation between VLS and the breadth of VK. By examining 850 Chinese university learners of English, they reported that several strategies were positively correlated with vocabulary breadth, including contextual guessing, skillful utilization of dictionaries, note-taking, attentiveness to word formation, contextual encoding, and activation of newly learned words. Consistent with Gu and Johnson's results, subsequent studies have also demonstrated that the employment of specific types of VLS may facilitate the expansion of vocabulary size. For example, research has indicated that learners investing more efforts in encountering and practicing newly learned vocabulary beyond the confines of the classroom tend to achieve greater success in vocabulary learning and that frequent dictionary use seems to establish a firm foundation for lexical learning (Kojic-Sabo & Lightbown, 1999). Nonetheless, it is worth noting that while vocabulary breadth

knowledge constitutes one significant dimension of VK, there exists another crucial aspect known as the depth of VK (Nation, 2001; Qian, 2002). In a study conducted by Nassaji (2006), an examination was undertaken to explore the potential correlation between the depth of VK and the employment of lexical inferencing strategies (i.e., strategies to deduce the meaning of unknown words). Adopting an introspective think-aloud protocol to discern various lexical inferencing strategies as well as the Word Association Test (Read, 1993) to measure the depth of VK, Nassaji found that learners with higher level of depth in their VK demonstrated a greater degree of success in lexical inferencing. While Nassaji's study shed useful light on the association of VK with lexical inferencing strategies, which is only one type of meaning discovery strategy, its association with other types of VLS was not investigated. The gap was later addressed by Zhang and Lu (2015) with a sample size of 150 university students. Their investigation aimed to explore the relationship between different types of VLS and both the breadth and depth of VK simultaneously. They found that strategies centered around learning word forms (e.g., spelling and sounds) and associative meanings of words (e.g., synonyms, roots, affixes, and other words within the semantic field) were significant predictors of both the breadth and depth of VK, whereas the utilization of word lists had a negative effect. In a similar vein, Fan (2020) conducted a study on 419 Chinese learners of English as a foreign language (EFL) utilizing a combination of vocabulary size and depth tests, as well as VLS questionnaire. The results of this study showed that two specific strategies, namely attention (i.e., attending to vocabulary while reading English texts or watching English media) and guessing (i.e., guessing word meanings from contextual cues in texts or situations), positively predicted both types of VK. Conversely, the strategy of socializing (i.e., seeking help from others regarding word meanings and usage) had a negative effect on VK.

In addition, a number of studies have examined VLS specially within the realm of classroom settings. Grenfell and Harris (1999), for instance, investigated the efficacy of instructing students in vocabulary mnemonic strategies. Their study revealed that through the implementation of awareness-raising activities, participants displayed an increased understanding of metacognitive strategies and exhibited a greater willingness to employ newly acquired vocabulary mnemonic strategies. Mnemonic strategies are not only beneficial for learning vocabulary but also have a positive

impact on test performance. In a more recent study, Mizumoto and Takeuchi (2009) explored the effectiveness of explicit instruction of VLS using a group of 146 female EFL learners from two Japanese universities. The results showed that the experimental group which exclusively received explicit instruction on strategies outperformed the control group in the vocabulary test. Additionally, the study revealed that strategy training in the classroom setting could effectively alter the frequency of learners' utilization of mnemonic strategies, which exhibited a positive correlation with the participants' language performance. Although the study's findings have contributed to a better comprehension of VLS instruction, there are several limitations, including relatively short period of time (four months), participants' homogeneous proficiency levels and entire reliance on self-reported questionnaires.

Summing up, the findings from the aforementioned studies have contributed to the understanding of effective VLS and their impact on learners' VK and language performance.

2.2 Motivation in L2 learning

Likewise, scholars have also reached the consensus on the significant role of motivation as an affective factor that influences the process of L2 learning (e.g., Csizer & Dörnyei, 2005; Gardner, 1985). As Dörnyei (2005) emphasized, “without sufficient motivation, even students with the most remarkable abilities cannot accomplish long-term goals” (p.65). Research conducted in this field has utilized various theoretical frameworks, including the socio-educational model (Gardner, 1985, 2010; Gardner & Lambert, 1959), the self-determination theory (SDT, Deci & Ryan, 1985; Ryan & Deci, 2000), and the L2 motivational self system (L2MSS, Dörnyei, 2005, 2009). However, some frameworks have faced criticism for various reasons. One such example is the socio-educational model, which has raised mounting concerns due to its theoretical content. The concern arises from the lack of obvious connections with the emerging cognitive motivational concepts in motivational psychology and also from the label “integrative” in the model which has been regarded as restrictive and not applicable to many language leaning environments (Dörnyei, 2009). The study adopted SDT as the theoretical framework for investigating L2 learning motivation because firstly SDT is adopted more frequently to examine the correlation between motivation and L2 proficiency (e.g.,

Zhang et al, 2017); and secondly a large body of studies have employed the framework in examining motivation and VK (e.g., Lee et al., 2022).

SDT is concerned with the three fundamental psychological needs: autonomy, competence and relatedness, influencing human motivation to engage in activities and determine how individuals' behaviors are predictive of performance and subjective well-being (Deci & Ryan, 1985). There are two primary motivational orientations according to SDT, one based on intrinsic interest in the activity per se driven by the inherent satisfaction it provides and the other based on extrinsic rewards. These types of motivation are not categorically different but exist on a continuum of self-determination. According to Deci and Ryan (1985), IM is predicated upon innate needs for competence and self-determination. The researchers postulate that individuals, when granted the freedom to select an activity, will actively seek out stimulating contexts that offer opportunities to surmount the challenges that the activity presents. Through their efforts to overcome these challenges, individuals cultivate a perception of competence in their own abilities. Subsequently, Vallerand, Pelletier, Blais, Brière, Senécal and Vallières (1992) recruited 745 university students from province of Ontario to assess the Academic Motivation Scale (AMS) developed based on SDT. The findings provided adequate evidence supporting the factorial validity and reliability of the AMS and its effectiveness as a tool for investigating motivation in educational research. Later, Vallerand et al. (1993) further examined the concurrent and construct validity of the AMS through correlational analyses among the AMS sub-scales involving 217 junior-college students. The findings supported the validity of the AMS, further affirming its suitability for measuring motivation in educational context. The researchers thus proposed a three-fold taxonomy of IM: IM-Knowledge, whereby learner's pleasure is derived from the process of exploring novel ideas and expanding knowledge; IM-Accomplishment, pertaining to the sensations in regard to striving to achieve a specific goal; and IM-Stimulation, associated with the sensory stimulation elicited by performing a particular task, such as aesthetic appreciation. In contrast to intrinsically motivated behaviors, extrinsically motivated behaviors are characterized by their pursuit of instrumental objectives, such as obtaining a reward or evading a punishment. It is important to note that the presence of EM does not necessarily indicate a deficiency in self-determination regarding the actions undertaken. Rather,

Deci and Ryan (1985) maintained that various forms of EM can be positioned on a continuum based on the degree to which they are internalized within an individual's self-concept (that is, the extent to which the motivation is “self-determined”). Similarly, EM can also be subdivided into three levels (Vallerand et al., 1992, 1993). External regulation, the lowest level of self-determination, is defined as activities that are regulated by external factors, such as tangible rewards or punishments. Further internalized into the self-concept is introjected regulation, characterized by behaviors that are activated as a result of some pressures that individuals have internalized within themselves, although not necessarily stemming from personal volition or choice. The most self-determined form of EM is identified regulation, where individuals perform an activity due to their recognition and personal value attached to it. Individuals oriented towards external regulation and introjected regulation are prone to discontinue their efforts in L2 learning once the pressures are alleviated (Noels, Clément & Pelletier, 2001), whereas those oriented towards IM and identified regulation are relatively more self-determined, leading to greater persistence in their learning endeavors.

2.2.1 Intrinsic/extrinsic motivation and L2 learning

IM holds significance in the realm of L2 acquisition, as emphasized by numerous scholars. Noels and collaborators have conducted extensive research confirming a high level of IM is linked to lower anxiety (Noels, Clément, & Pelletier, 1999; Noels, Pelletier, Clément & Vallerand, 2000), higher perceived autonomy and competence (Noels et al., 2001), persistence (ibid) and stronger intention to continue L2 studies (Noels et al., 1999, 2001). When considering the literature as a whole, it becomes evident that there is a substantial body of evidence supporting the positive impact of IM on language learning. In contrast, there is currently no consensus regarding the relationship between EM and L2 learning. Noels et al. (2000) examined 159 adult anglophone students learning French to calculate the correlations between IM and EM orientations and four L2 psychological constructs (i.e., perceived competence, perceptions of freedom of choice, anxiety, and intention to continue L2 studies). The results showed that external regulation and introjected regulation had either low or no correlations with the aforementioned psychological variables. In contrast, the identified regulation and all the IM sub-scales exhibited significant and positive associations with these variables, except for anxiety, which displayed a negative

pattern. The study has made valuable contribution to an increasing body of research on IM and EM by examining a language group beyond the typical focus on anglophone Canadians or Americans. One year later, Noels et al. (2001) conducted a replication study focusing on IM and EM in adult francophone learners of English. They recruited 59 participants and administered a questionnaire that explored various aspects, including the participants' motivations for language learning (i.e., IM and EM), hypothesized antecedents influencing their motivations (i.e., perceptions of autonomy and competence), and consequences (i.e., persistence in English study, motivational intensity, and course achievement). The results exhibited concordance with previous research, indicating that IM was positively correlated with all the consequence variables, while their correlations with EM sub-scales were mixed. However, the findings specifically focused on the motivational propensities of Anglo-Canadian students. Therefore, caution should be exercised when generalizing these findings to other types of language students. The aforementioned studies provide evidence supporting sustained positive relationships between IM and various aspects of L2 learning, whereas the correlation between EM and L2 learning is non-existent under some circumstances.

Other studies involving EFL samples from diverse first language (L1) backgrounds have presented more varied outcomes (e.g., Pae, 2008; Shaikholeslami & Khayyer, 2006; Takahashi & Im, 2020). In a recent investigation carried out by Takahashi and Im (2020), a cohort of 545 Japanese university students was recruited to explore the interconnections among motivational constructs within SDT, learners' intended L2 learning effort, and L2 proficiency. The results of the study indicated that internalized types of motivation in SDT were influential in driving learners' intended effort, which subsequently predicted L2 proficiency. Among the internalized types of motivation, IM played the most substantial role in driving learners' effort, with identified regulation following closely in significance. The robust motivational powers of both IM and identified regulation align with previous studies (e.g., Noels et al., 1999; Noels et al., 2000). However, introjected regulation showed a significant, albeit relatively weak, predictive relationship with intended learning effort. Similarly, Pae (2008) investigated the structural relationships among various factors affecting L2 achievement using a sample of 315 Korean students learning English. The results demonstrated that IM was the strongest determinant of learners' self-confidence and

motivation (i.e., motivational intensity and desire or more positive attitudes toward L2 learning). Nevertheless, the study did not report the relationship between EM and L2 learning as the model containing subcategories of EM resulted in an unsatisfactory fit. While EM was not the primary variable under investigation, it is recognized as the antithesis of IM and worth further scrutiny. In an earlier study conducted by Vandergrift (2005), the relationship between motivation (i.e., IM and EM) and proficiency in listening comprehension was examined using 57 adolescent learners of French. The results showed that the correlations between proficiency and two motivational orientations were non-significant, which suggests that a high degree of motivation does not appear to be a reliable predictor of proficiency in L2 listening.

2.2.2 Motivation in L2 vocabulary learning

Despite the extensive body of research on learners' motivation, there has been limited attention given to investigating the influence of motivation on L2 vocabulary learning (e.g., Laufer & Hulstijn, 2001; Papi, 2018; Tseng & Schmitt, 2008; Zheng, 2012). These studies provide both indirect and direct evidence of the connection between motivation and vocabulary acquisition. As an example, Elley (1989) discovered that instructional materials that enhanced learners' interest and motivation resulted in improved vocabulary acquisition. Similarly, Gardner and MacIntyre (1991) demonstrated that both integrative motivation and instrumental motivation can enhance vocabulary learning. Indeed, considering the significant impact of motivation on language learning, it is essential to conduct further research to systematically investigate its influence on the vocabulary learning process. An important contribution in this regard is Tseng and Schmitt's (2008) study, in which they proposed a structural model of vocabulary learning by taking a process-oriented approach (i.e., initial appraisal, self-regulating capacity, strategic involvement, mastery of tactics, VK and postappraisal of the effectiveness), and operationalizing vocabulary learning as a cyclical process. This model proposed that motivational constructs have a significant influence on VK, which is succinctly summarized by the authors as follows: "motivation appears to be involved in all stages of [vocabulary] learning (instigating, sustaining, and evaluating), thus permeating the whole process" (Tseng & Schmitt, 2008, p. 383).

However, extant studies on the relationships between motivation and L2 VK have yielded mixed findings (e.g., Alamer, 2022; Fontecha & Gallego, 2012). For example,

Fontecha and Gallego's research (2012) measured receptive vocabulary size and motivation to learn English among 186 EFL Spanish students who were studying in the 8th and 9th grades. They found that the students with higher levels of motivation achieved higher scores on receptive vocabulary tests than those with lower motivation in the 9th grade; however, the pattern was not observed among students in the 8th grade. A more recent study conducted by Alamer's (2022), involving 366 Saudi EFL students, revealed that autonomous motivation (i.e., IM and identified regulation) positively predicted vocabulary size, whereas controlled motivation (i.e., introjected regulation and external regulation) had a negative impact on vocabulary size. The review of these studies highlights the importance of measuring the subconstructs of motivation and suggests that additional variables may be involved in mediating the relationships between motivation and L2 VK.

2.3 Relationships between motivation, strategies and L2 VK

Motivation and learning strategies are closely intertwined, as motivational factors are considered essential for self-regulated learning (Ryan & Deci, 2000). Motivated students engage in active regulation of their learning process through the use of cognitive and metacognitive learning strategies, which suggests that such strategies may mediate the effect of motivation on learning outcomes (Pintrich, 1988; Pintrich & De Groot, 1990).

The combined influence of motivation and learning strategies on academic achievement has been extensively documented in non-L2 research (e.g., Law, 2009; Logan, Medford & Hughes, 2011). However, empirical research investigating the mediating role of strategy use in the association between motivation and L2 vocabulary learning remains limited in the existing literature (e.g., , Ahn & Lee, 2022; Lee, 2020; Tseng & Schmitt, 2008; Zhang et al., 2017). Tseng and Schmitt (2008) made a pioneering contribution by examining the direct impact of proficiency in vocabulary learning tactics on VK and further suggested that the utilization of learning strategies, encompassing both the quantity and quality dimensions, is contingent on learners' initial motivational state. In another more recent study conducted by Lee (2020), which involved a sample of 492 Korean undergraduate students enrolled in an English academic writing class, the researcher investigated the impact of various variables, namely L2 aptitude, motivation, strategy, language processing experience, and gender, on the breadth and depth of L2 VK. The findings

relevant to motivation, strategy and VK demonstrated that motivation had a direct influence on the utilization of strategies. Additionally, motivation indirectly affected both components of VK via the mediating role of language processing experience. Interestingly, the study revealed that strategy use did not significantly predict VK. Lee attributed this particular finding to the possibility that her participants, who were at advanced level of proficiency, may have employed a specific set of strategies selectively, thus resulting in a lack of a significant relationship between strategy use and VK. She added that this finding “does not imply that using or promoting L2 vocabulary strategies is not relevant for language learning, rather it suggests that when considering the complexity of VK development, there are individual factors that may not be as pertinent as others” (e.g., age, proficiency) (p. 12).

However, the aforementioned studies did not establish a direct causal relationship between motivation and VK, nor did they investigate whether the effect of EM on VK is mediated in a comparable manner to the effect of IM. To address these limitations, Zhang et al. (2017) and Lee et al. (2022) conducted two parallel studies employing the framework of self-regulated learning and structural equation modeling (SEM). The study conducted by Zhang et al. (2017), involving a sample of 107 Chinese 10th grade EFL learners, revealed a direct influence of motivation on VLS and VK. Furthermore, it was observed that the relationship between motivation and vocabulary learning was partially mediated by the implementation of learning strategies. When categorizing motivation into IM and EM, it was found that EM did not directly predict vocabulary size, but rather exerted its influence indirectly via VLS. On the other hand, IM directly and indirectly predicted VK and had a more substantial impact on the use of VLS. Regarding the more recent study carried out by Lee and collaborators (2022), data was collected from a total of 185 Korean adolescent learners of English. The researchers found a direct relationship between motivation and both the size and depth of VK. In addition, motivation also indirectly predicted VK via VLS. When further classified, IM was found to have a stronger influence on the use of VLS and VK than EM.

2.4 Summary of the reviewed literature

In summary, the findings highlight the importance of motivation and learning strategies in L2 vocabulary learning. IM, coupled with the effective use of VLS, contributes to the development of VK. However, further research is needed to explore

the relationship between EM, strategy use and VK. Moreover, the extant literature demonstrates several strengths including the use of diverse methodologies especially SEM and the incorporation of established theoretical frameworks such as SDT, which enhanced the validity of the findings. However, certain limitations are evident, such as the exclusive reliance on self-report measures, which may be subject to biases and inaccuracies. Additionally, the relatively small sample sizes and the homogeneity of participant groups in some studies may limit the generalizability of the findings to broader populations.

2.5 Research questions

The present study attempts to address some research gaps identified through the review of previous studies examining the relationships between motivation, VLS and VK. First, the primary focus of numerous studies lies within the demographic of undergraduate L2 learners (e.g., Lee, 2020; Tseng & Schmitt, 2008) and adolescents (e.g., Lee, et al., 2022; Zhang et al., 2017). As Zhang et al. (2017) suggested, future studies should explore the generalizability of their findings to various age groups as their study primarily focused on tenth graders. This suggestion emphasizes the importance of investigating diverse developmental stages. One potential reason is the connection between motivation and age, since most studies conclude that motivation levels decline with age (e.g., Chambers, 1999; Ghenghesh, 2010; Williams, Burden & Lanvers, 2002). In Ghenghesh's (2010) study, for instance, a total of 144 students of English participated in the questionnaire surveys and 20 of the students proceeded with semi-structured interviews. The results obtained from quantitative analyses across five age groups revealed that older learners attained significantly lower scores on the motivational scales. Furthermore, the interview data provided additional evidence to support this finding. Another reason lies in the correlation between age and strategy use. Numerous studies have documented variations in the utilization of strategies based on age (e.g., Ardasheva & Tretter, 2012; Magogwe & Oliver, 2007; Peacock & Ho, 2003). Peacock and Ho (2003), for example, conducted a study to explore the utilization of 50 common L2 learning strategies by 1,006 students across eight disciplines at a university in Hong Kong. The research employed a standardized questionnaire and subsequent interviews. The results revealed that older students displayed greater proficiency in affective and social areas than did younger students. Given the aforementioned studies, it is imperative for forthcoming studies to

investigate the applicability of findings across different age groups to better understand the relationships between motivation, VLS and L2 VK.

Second, most researchers investigating Chinese L2 learners tend to concentrate predominantly on relatively developed regions such as Beijing (e.g., Gu & Johnson, 1996), Taiwan (e.g., Tseng & Schmitt, 2008) and South China (e.g., Zhang & Lu, 2015). The examination of the relationship between socio-economic status (SES), which encompasses factors such as residential location and level of education, and English proficiency reveals that theories of L2 acquisition suggest a significant influence of SES on the English learning outcomes (Ellis, 1994). Empirical studies have also shown the positive correlation between SES and English proficiency (e.g., Kieffer, 2010; Lorenzo, Granados & Rico, 2021; Muttaqin, Chuang, Lin & Cheng, 2022). An example is the study conducted by Muttaqin et al. (2022), which investigated the relationship between SES, academic achievement and English proficiency using data collected from 234 English-medium instruction (EMI) students at a university in Indonesia. The results revealed that SES significantly predicted students' academic achievement and English proficiency.

In light of the identified gaps and the significance of resolving them, the study aims to explore the relationship between motivation, VLS and L2 VK with adult EFL learners who have discontinued their formal school settings. In addition, the study has chosen Jilin province for convenience reasons, a less developed region in Northeast China compared to the regions mentioned above that has received limited attention in investigations of this kind. In view of these considerations, the present study intends to address the following two research questions:

- (1) What are the relationships between motivation, VLS and VK?
- (2) To what extent do IM and EM function differently with VLS and VK?

CHAPTER 3. Methodology

This chapter provides a comprehensive overview and rationale for the methods employed in the present study. Initially, section 3.1 presents an outline of the research design, followed by a detailed account of the participants under investigation (section 3.2). Subsequently, the instruments utilized in the study are elucidated in section 3.3. Sections 3.4 and 3.5 delineate the piloting phase and procedural details, respectively. Furthermore, in section 3.6, the analysis strategy employed in the study is outlined. Ethical considerations are subsequently addressed in section 3.7.

3.1 Study Design

The study followed a quantitative, cross-sectional design to investigate the relationship between two motivational orientations, vocabulary learning strategies (VLS) and vocabulary knowledge (VK). The main objective of the study was to explore the mediating role of VLS in the relationship between three independent variables, motivation, intrinsic motivation (IM) and extrinsic motivation (EM) and the dependent variable, VK. In order to address the research questions, the study implemented structural equation modeling (SEM) analyses to construct three models first, based on the understanding of the extant literature (e.g., Lee et al., 2022; Zhang et al., 2017).

Model 1, as depicted in Figure 1 (page 39), assumes that motivation (a latent variable) exerts both direct and indirect effects on VK (an observed variable). The indirect influence operates through the mediation of the VLS (another latent variable). Motivation is measured by two observed variables: IM and EM, whereas the VLS is assessed through five observed variables: determination strategies, social strategies, memory strategies, cognitive strategies and metacognitive strategies. In the hypothesized Model 2, illustrated in Figure 2 (page 43), a notable distinction from Model 1 is the substitution of motivation with IM, which is operationalized through three indicators: knowledge, accomplishment, and stimulation. In a similar vein, the hypothesized Model 3 (refer to Figure 3 on page 44) replaces IM with EM. In Model 3, EM is measured by indicators including external regulation, introjected regulation and identified regulation.

Upon completing the establishment of three models, the study proceeded to collect data from the targeted adult learners of English as a foreign language (EFL) in Jilin

province, China. Following a data trimming procedure, the appropriate data was allocated to each model for subsequent analysis utilizing SEM. A thorough description of the process will be provided in the forthcoming sections.

3.2 Population and participants

This section first outlines the population targeted by the study, followed by delineating the criteria for sample selection. Furthermore, a comprehensive description of the collected sample is provided. In determining the sample size for SEM, the study took into account various commonly used guidelines, including the minimum recommended sample size (e.g., $N \geq 100-200$), the minimum number of cases required for each freed parameter (e.g., at least 5–10 cases per parameter), and the minimum number of cases per indicator in the model (cf. Bentler & Chou, 1987; Boomsma, 1983; Ding, Velicer, & Harlow, 1995; Tanaka, 1987). A power analysis was also conducted using the pwrSEM tool (Wang & Rhemtulla, 2021). Based on the work of Cohen (1988, 1992), the commonly employed threshold to determine acceptable power is .80. This corresponds to an 80% probability of rejecting a false null hypothesis. The result revealed that for a large effect (.80), a minimum of 140 participants was necessary, which also satisfied all the aforementioned guidelines.

3.2.1 Population

The study focused on a demographic consisting of a cohort of adult EFL learners working and residing in Jilin province, China. Jilin province has been perceived as having relatively lower socioeconomic development compared to some other provinces in the country. This can be explained by its economic transition from heavy industries to newer sectors, leading to job losses, and its experienced population outflows as people seek enhanced economic prospects in more prosperous regions. The majority of the target demographic was affiliated with a community-based English club and attended weekly English-focused events coordinated by the club on a regular basis. The consistent involvement ensured a certain level of exposure to English. The population encompassed a broad spectrum of ages, diverse first language (L1) backgrounds, and varied levels of experience in terms of residing or studying abroad.

The reason for selecting this specific population was primarily the researcher's extensive involvement in many activities organized by this English club for almost a

decade. Through active participation in these activities, the researcher has observed that attendees with different levels of English proficiency tend to vary in their motivations for learning English and the learning strategies they adopted. As a result, the members of this English club exemplify a potential population for this study, owing to their distinctive attributes and experiences pertaining to motivation, strategies and English proficiency, which can contribute valuable insights to the research objectives.

3.2.2 Inclusion and Exclusion Criteria

In contrast to school settings, the English club mentioned earlier exhibited considerable heterogeneity among its members. Consequently, specific criteria were established to ensure homogeneity when selecting adult EFL learners for the study. Furthermore, the sample screening process was conducted in two stages. The initial stage entailed setting a general entry threshold to obtain a suitable quantity of samples, while the subsequent stage aimed to exclude non-compliant samples, thereby yielding the final study sample.

In the initial phase of the screening process, prospective candidates were required to meet a prerequisite age threshold of no less than 22 years, which corresponds to the average minimum age for obtaining a bachelor's degree in China. Thus, there is little likelihood that they were still exposed to the structured and extensive English training courses, typically provided within the confines of a formal educational environment. The amalgamation of a population undergoing professional English instruction in conjunction with a population characterized by intermittent English learning may have an impact on the research outcomes. Furthermore, individuals who exceeded the age threshold of 22 but had not yet graduated were excluded from the study due to the aforementioned reason, despite their small representation in the sample. Second, the selection of target participants was restricted to native speakers of Chinese, as the inclusion of participants with diverse L1 backgrounds might introduce influences on VLS and VK. It is believed that languages that exhibit greater similarity to English than Chinese does, result in L1 speakers of those languages acquiring a larger repertoire of English words and consistently favouring specific VLS, such as the utilization of cognates. Third, it is a requirement for participants to presently reside and work within Jilin province, which is situated in the northern region of China. This particular region is characterized by a lower socio-economic status (SES) in

comparison to populations residing in the southern parts of the country. The inclusion of this criterion is based on the recognition that SES has the potential to impact literacy levels, including VK (see section 2.5). Fourth, participants must possess prior study abroad experience that was constrained to a maximum duration of one year. Fifth, it is imperative for participants to maintain regular engagement in English learning or utilization. This criterion was incorporated with the intention of enhancing the likelihood of their motivation towards English learning, which serves as one of the variables within the research framework.

In the second screening, a majority of the non-compliant samples were excluded from the analysis, which included nine individuals who exhibited complete non-participation in the administered vocabulary test. This presented a contradiction in relation to their demographic information, as it indicated their time dedicated to English learning, spanning from 5 to 26 hours per week. Thus, it is improbable that they had zero knowledge of the English vocabulary tested. It is noteworthy that certain participants who had surpassed a duration of one year residing abroad were ultimately incorporated into the study because their experiences were not continuous. Only those who sustained an uninterrupted residence abroad for a duration exceeding one year were excluded from consideration.

3.2.3 Sample

A total of 153 adult EFL learners were recruited via text messages (Appendix 1) and snowball effect. The study sample comprised individuals whose ages ranged from 22 to 55, with an average age of 31.16 (SD=6.68). With regards to gender distribution, 46.15% were male (N=66) and 48.95% were female (N=70). Table 1 provides a summary of the demographic information pertaining to the participants. As evidenced in the table, the participants had an average of 15.12 years (SD=7.53) of English learning experience and the majority possessed, at minimum, a bachelor's degree prior to their involvement in the study. Consequently, it is plausible to infer that they had established a variety of strategies concerning vocabulary learning, given that English has been made a mandatory subject since primary school in Jilin province. At the time of the study, the participants were still regularly exposed to English for an average of 10.82 hours (SD=11.03) per week, which, although not guaranteeing the presence of English learning motivation, did increase its likelihood, especially considering their consistent participation in English-related activities. Nearly all the

participants had a maximum of one year of experience studying or residing in English-speaking nations (3 exceptions), and their self-reported English proficiency was at a low level, which adequately reflect the typical English learning environment of this region in general.

Table1. Demographic information of participants (N=143)

Category	Sub-category	Number	Percent
Gender	Male	66	46.15%
	Female	70	48.95%
	prefer not to say	7	4.90%
Age	22-30	75	52.44%
	31-40	56	39.16%
	>40	12	8.39%
Region	Changchun City, Jilin Province	119	83.21%
	Other areas in Jilin Province	24	16.78%
Highest degree of education	High school or lower	3	2.10%
	Bachelor's degree	97	67.83%
	Master's degree	41	28.67%
	PhD. or higher	2	1.40%
Overseas experience in English-speaking countries	Yes (\leq 1 year)	14	9.79%
	Yes(>1 year)	3	2.10%
	No	126	88.11%
Self-reported proficiency level	Advanced	4	2.80%
	Upper-intermediate	4	2.80%
	Intermediate	73	51.05%
	Pre-intermediate	34	23.78%
	Elementary	28	19.58%

3.3 Research Instruments

The study employed a tripartite survey consisting of three questionnaires. The first questionnaire focused on gauging the participants' motivation, the second was designed to assess their strategies for learning English vocabulary, while the third was intended to elicit demographic information. Additionally, a test was administered to measure participants' vocabulary breadth. The questionnaire items were primarily presented in Chinese, with English examples included only when necessary to ensure that the participants could comprehend each item and make informed decisions. Hence, the study utilized back translation (Brislin, 1970), wherein the English questionnaires were initially translated into Chinese by the researcher, and subsequently translated back into English by another translator, who holds a Master's degree in Translation Studies and has no prior knowledge of the original questionnaires. Through a comparison of the original English version with the back-translated version, the researcher was able to identify and reconcile any confusion or errors that may have arisen from subtle linguistic differences. All instruments were administered online via Qualtrics. The first two questionnaires and the vocabulary test were described as follows.

3.3.1 Motivation

The Language Learning Orientations Scale (LLOS, Noels, Pelletier & Vallerand, 2000; see Appendices 2.1 and 2.2) was adopted in the study. The questionnaire investigates both IM and EM. IM (nine items) consists of knowledge, accomplishment, and stimulation (see Table 2 for more details). EM (nine items) includes external regulation, introjected regulation, and identified regulation (see Table 2). The reason why the LLOS was chosen is twofold. On the one hand, the LLOS is adopted more frequently to examine its correlation with L2 proficiency (e.g., Zhang et al., 2017). Considering the research questions pertaining to the influence of motivation on L2 VK, the LLOS was properly selected. In addition, a large body of studies have employed the LLOS in examining motivation and VK (e.g., Lee, et al., 2022; Zhang et al., 2017). It is worth noting that the L2 motivational self system (L2MSS, Dörnyei, 2009) is also commonly used for measuring motivation in L2 learning. This study did not favor the L2MSS for it is a theoretical framework employed for predicting the intended learning effort (e.g., Papi, 2010; Ryan, 2009; Taguchi, Magid & Papi, 2009) instead of actual achievement. On the other hand, the

piloting results showed that the questionnaire was well-worded and could comprehensively capture the participants' motivation for learning English.

The study made modifications to the original LLOS prior to data collection (see Appendices 2.1 and 2.2 for both English and Chinese adapted version). First, a 5-point Likert scale was employed, with “not applicable at all” anchoring the left end and “extremely applicable” anchoring the right end. The scale in the current study is not commensurate with the original version developed by Noels, Pelletier and Vallerand (2000). The original questionnaire adopted a 7-point Likert scale, which was also predominantly utilized by previous LLOS studies (e.g., Shaikholeslami & Khayyer, 2006; Vandergrift, 2005; Zhang, et al., 2017). This modification was mainly attributed to the piloting results, which revealed that more than half of the participants encountered difficulties in distinguishing between the 7 categories of the scale and expressed a preference for a reduced number of categories. The 5-point Likert scale has also been used in prior research on IM and EM (e.g., Lee, et al., 2022), also lending some support to its use in this study.

Second, some statements underwent revision in translation to enhance the participants' comprehension, including altering one English-learning motivation from “to show myself that I am a good citizen because I can speak a second language” into “to show my competence in English speaking”. The modification was made due to feedback from participants in the pilot study who expressed that English proficiency was not an obligation or responsibility of a “good citizen” in China. In addition, considering the EFL learners as the subjects of the study, “second language” in the questionnaire was amended to “English”. The decision was taken with the objective of mitigating any potential confusion, taking into account the presence of individuals who might have a different language as their L2. In general, these reworded statements maintained the fundamental meaning of the original ones.

3.3.2 VLS

The Vocabulary Learning Strategies Survey (VLSS) devised by Schmitt (1997) was adopted in the present study to gauge learners' use of VLS. The survey is comprised of two parts: Part I comprises 14 items focused on the strategies to discover the meaning of new words; Part II contains 44 items pertaining to the strategies to consolidate a word after its initial encounter (see Table 2 for more details). The VLSS was chosen primarily for its comprehensive inventory of VLS, the

comprehensiveness of which was substantiated through a pilot study. Another reason for this decision is that the VLSS is frequently employed in the studies of a similar scope as the present study (e.g., Lee, 2020; Tseng & Schmitt, 2008; Zhang & Lu, 2015), albeit with modifications tailored to suit their specific purposes, as the current study has done.

There were three major modifications (see Appendices 2.3 and 2.4 for both English and Chinese adapted version). First, to minimize any potential misinterpretations of the strategy statements, all items were presented in Chinese. However, English examples were provided where deemed necessary by the researcher, mostly in relation to terminologies. The examples were selected by primarily citing Schmitt's (1997) original examples. For instance, the study utilized Schmitt's (ibid) 'scale' examples (i.e., huge/big/medium-sized/small/tiny) to explain the strategy 'use scales for gradable adjectives'. Examples from other resources were also incorporated to enhance the applicability of the explanations to Chinese EFL learners' situation (e.g., Wei, 2015; Zhang, Wu, Zhou & Meng, 2019). For instance, 坦克/*tan3ke4*/, meaning "tank", was chosen to elucidate the use of cognates from Chinese as a strategy to learn English vocabulary. Serving the same purpose, pictures were incorporated to clarify terms such as semantic maps and semantic feature grids.

Second, four questionnaire items were integrated as per the participants' feedback in the pilot study, including "Image word's meaning", "Use Keyword Method¹", "Peg Method²" and "Loci Method³". The primary reason for the integration arose from the difficulty the participants encountered in comprehending especially "Peg Method" and "Loci Method", even with the aid of Schmitt's explanations and additional pictures. The other reason is the similarities among the four items, as they all fall within the broader category of the 'memory' subcategory. Therefore, they were consolidated into a single item, restating "associate words with relevant scenes, locations, and images".

¹ Use Keyword Method is a mnemonic strategy that links an L1 word with a similar-sounding L2 word, such as the English word *cat* and the Japanese word *katana* (sword). An image combining the two concepts is created. When hearing the L2 word, the sound similarity invokes the created image which prompts the L2 word's meaning.

² Peg Method is a mnemonic technique used to remember lists of items in a specific order by associating each item with a numerical peg word. These peg words are typically rhyming words that correspond to the numbers from 1 to 10.

³ Loci Method is a mnemonic technique that utilizes spatial and visual associations to aid in memory recall. It involves mentally associating the items to be remembered with specific locations in a familiar environment.

Third, the selection of 5-point Likert scale was also grounded on the results of the pilot study, whereby the participants responded that it enabled them to make explicit choices compared to a 7-point Likert. Therefore, in the subsequent full-scale study, the participants were asked to indicate the extent to which they employed a particular strategy to learn English vocabulary on a 5-point Likert scale with a range of 1 (never use) to 5 (always use).

3.4 Piloting

All the questionnaires were initially piloted with four participants, who possessed comparable previous learning experiences to those of the main study participants. Two of the four participants were the event organizers and coordinators and of the English club, whereas the remaining two were the regular attendees. The researcher first contacted them in April 2023, describing the study details and inquiring about their willingness to participate, and verbal confirmation was obtained. In early May of the same year, a follow-up contact was made via WeChat, a widely utilized messaging and calling application in China and a positive response was received. This pilot phase enabled the refinement of the questionnaires, as described in section 3.3. A second pilot was conducted, including two participants who fulfilled all the inclusion criteria for sample section, for the reason that some items in the VLS questionnaire had undergone a major modification subsequent to the first pilot. The two participants, who were also regular attendees, were recruited via text messages. No problems were encountered in the second pilot process, indicating the readiness of the experiment for actual data collection.

3.5 Procedure

Following the piloting process, as outlined in section 3.4, the researcher proceeded to seek the club organizers' consent regarding the distribution of the questionnaires and the test in mid-May 2023. Upon obtaining the permission, an informative notice elucidating the purpose of the study and appealing for volunteers was sent to the groups affiliated with the club (Appendix 1). Individuals were invited based on their willingness to participate. It was decided to administer the questionnaires online to expand the reach of the study beyond the confines of the club, while simultaneously affording greater flexibility to the adult participants.

Each participant received a Qualtrics link through which they could access and complete all the questionnaires and the test. The administration sequence in Qualtrics commenced with the questionnaires on motivation and VLS, followed by the VLT. Subsequent to completing the VLT, they proceeded with the questionnaire collecting demographic information. The order was strategically determined based on the degree of difficulty, with progressively more challenging questions positioned towards the later stages. The inclusion of easier questions at the beginning was intended to increase participant engagement and discourage premature discontinuation. Upon completion of the study, they were provided with the answers to the VLT and offered the opportunity to participate in an online sharing session of the summary of the findings. The participants were not subjected to time constraints while completing the questionnaires and the test, despite the average completing time ranging from 20 to 30 minutes. They were informed that all the items in the questionnaire on motivation and VLS were mandatory, whereas items in the VLT could be answered based on their knowledge. Furthermore, they were assured that they could skip any unknown questions without deductions in scores, with the purpose of reducing the likelihood of random guessing.

The process of collecting data spanned a duration of two weeks, concluding in late May, 2023. However, in the subsequent data trimming process, nine people who did not meet the inclusion criteria described in section 3.2.2 were excluded. Therefore, the Qualtrics portal was reopened in early June, 2023 to gather additional data.

3.3.3 VK

The Vocabulary Levels Test (VLT; see Appendix 3) developed by Schmitt, Schmitt, and Clapham (2001) was used for evaluating the English vocabulary sizes of L2 learners. The VLT has demonstrated its validity as an effective tool for assessing the word knowledge of English learners across various frequency levels (Schmitt et al., 2001) and is widely recognized as the predominant test used for measuring the breadth of vocabulary knowledge (Schmitt, 2010).

The VLT comprises five sections, each designed to evaluate the receptive knowledge of 30 target words belonging to specific frequency levels or the academic domain, with a total of 150 target words. The test contains frequency levels denoted as the 2,000 level, the 3,000 level, the 5,000 level, and the 10,000 level, wherein the 2,000 level encompasses a compilation of the most frequently occurring 2,000 words.

Similarly, the 3,000 level comprises words ranked in frequency from 2,001 to 3,000. The pattern continues with the 5,000 level and the 10,000 level, capturing words with ascending frequency ranks in their respective ranges. The academic level incorporates words selected from Coxhead's (2000) Academic Word List (AWL), comprising 570 word families that exhibit a predominant presence in academic texts (excluding words in the 2,000 level). The VLT divides the 30 designated words within each section into 10 distinct clusters. Within each cluster, there are three target words and three distractor words, along with three definitions (see excerpt 1). The participants were asked to associate each definition with the corresponding target word. For each accurate association, participants were awarded 1 point, whereas incorrect answers received no points, resulting in a maximum score of 30 points per section and a cumulative total of 150 points for the entire test.

Excerpt 1. VLT cluster

You must choose the right word to go with each meaning.

Write the number of that word next to its meaning.

1 business

2 clock _____ part of a house

3 horse _____ animal with four legs

4 pencil _____ something used for writing

5 shoe

6 wall

To avoid any potential ceiling effects, this study incorporated four levels – 2,000, 3,000, 5,000 and 10,000 words, as adult EFL learners' vocabulary levels cannot be reliably anticipated. The academic level was not considered for inclusion as the participants had left educational settings and academic words may introduce unnecessary ambiguity or complexity. Thus, the maximum score of the test adopted in the study is 120.

3.6 Analysis Strategy

In addition to trimming data based on the inclusion and exclusion criteria, the study adopted multiple imputation as a means of addressing missing data. Multiple imputation is recognized as the most commonly favored method for handling missing data in SEM and other data analytic scenarios (Allison, 2003; Schafer & Graham, 2002). Simple imputation procedures such as mean or regression imputation have inherent limitations as they tend to underestimate variances and overestimate correlations among variables (Brown, 2006). Multiple imputation reconciles this problem by introducing random variation into the process (ibid).

SPSS version 28 was subsequently used to calculate descriptive statistics, including internal consistency, means and normality. Internal consistency is typically measured by Cronbach's alpha (Cortina, 1993), which is considered acceptable within the range of .6-.7 and very good at .8 or higher. However, values higher than .95 should not be automatically considered good, as they might be an indication of redundancy (Hulin, Netemeyer, & Cudeck, 2001). The method of assessing normality in the study was skewness and kurtosis of the distribution. Skewness is a measure of the asymmetry of the distribution of a variable, whereas kurtosis is a measure of the peakedness of a distribution (Tabachnick & Fidell, 2014). When employing SEM, acceptable skewness values are between -3 and +3; appropriate kurtosis values are between -10 and +10 (Brown, 2006). However, West, Finch, and Curran (1995) proposed that a substantial departure from normality may be indicated by an absolute skewness value exceeding 2 and an absolute kurtosis value exceeding 7. Irrespective of all the standards, a perfectly normal distribution exhibits a skewness and kurtosis value of zero or in close proximity to zero. Therefore, the study regarded zero as a stringent standard, and 2 for skewness and 7 for kurtosis as a broader cut-off to assess the normality assumptions.

Instead of averaging item scores for a composite score, the researcher decided to compute latent variables for the four constructs involved in the study, including motivation and VLS in Model 1, IM in Model 2, and EM in Model 3. Furthermore, as these constructs exhibited both direct and indirect relationships, intertwined through intricate paths (i.e., multiple independent variables and dependent variables in one model), a number of regression analyses were implemented simultaneously. As a combination of latent variable computation and concurrent implementation of regression analyses (Byrne, 2001), SEM was used in the present study to investigate

the relationship between motivation, VLS and VK. SEM was adopted instead of multiple regression due to its consideration of “the measurement errors of the independent variables and dependent variables” (Raykov & Marcoulides, 2000, p. 7). As such, SEM exhibits a diminished susceptibility to the inaccuracies inherent in statistical estimates, which may result in deceptive or misleading conclusions (Raykov & Marcoulides, 2000). The research employed “Analysis of Moment Structures” (AMOS) version 18.0 to conduct the SEM analysis.

Prior to conducting a full SEM model, convergent validity and discriminant validity were calculated where applicable, in order to evaluate the quality and accuracy of measurement instruments. Convergent validity refers to the level of confidence that the indicators of a construct capture the intended concept, whereas discriminant validity refers to the extent to which measures of different constructs are unrelated (Campbell & Fiske, 1959; Cronbach & Meehl, 1955). The former can be assessed by the Average Variance Extracted (AVE) and Composite Reliability (CR). In accordance with established criteria, an AVE value exceeding .5 is considered acceptable (Fornell-Larcker, 1981), and a CR value of .7 and above is deemed satisfactory (Hair, Black, Babin & Anderson, 2009). In addition, the study also compared the factor loadings of all items in each measurement model with the standardized factor loading, for which the recommended threshold is a minimum of .5 and ideally .7 or higher (ibid). Discriminant validity, according to Fornell-Larcker’s (1981) testing system, can be assessed by comparing the amount of variance explained by the construct with the shared variance it has with other constructs. Thus, the square root of the AVE for each construct should be higher than the correlations between the constructs.

After ensuring the reliability and validity, the study ran the three SEM models. The following model fit indices provided by AMOS were employed by referring to Tseng, Dörnyei, and Schmitt (2006): chi-square/df (χ^2/df), goodness of fit index (GFI), adjusted goodness of fit index (AGFI), normal fit index (NFI), incremental fit index (IFI), Tucker-Lewis index (TLI), comparative fit index (CFI), and root mean square error of approximation (RMSEA). With respect to all the aforementioned indices except for χ^2/df and RMSEA, a value of $>.90$ on the 0-1.0 scale is typically regarded as a reliable indication of good fit. Regarding χ^2/df , there is some consensus in psychometric literature that a model demonstrates reasonable fit if χ^2/df does not

exceed 3 (Kline, 2016). In relation to RMSEA, a threshold of .08 or lower is indicative of a good level of fit between the model and the observed data (Browne & Cudeck, 1993).

Lastly, mediating effects were examined employing bootstrapping procedures. The fundamental concept of bootstrapping is to employ a resampling technique on the accessible data to enhance understanding of underlying population and make inferences (Efron & Tibshirani, 1994). Unstandardized indirect effects were computed for each of the 10,000 bootstrapped samples with 95% confidence intervals and 95% bias-corrected confidence intervals.

3.7 Ethical Considerations

Ethical approval and consent were obtained from the Central University of Oxford Ethical Research Committee (CUREC) (Appendix 4) prior to the initial contact with the organizers of the English club. The primary focus of the ethical considerations revolved around ensuring the protection of the rights of all participants and the English club throughout the study. Contact was first established with the club organizers through WeChat, wherein various research-related matters, such as the purpose of the study were discussed. Upon receiving their permission, an informative notice detailing the study was sent to the club's WeChat groups. All the prospective participants who agreed on the involvement were provided with a consent form (Appendix 6) outlining their entitlement to withdraw from the study within 48 hours subsequent to their submission. The consent form also explicitly ensured the safeguarding of privacy and security concerning experimental data. A WeChat group was established with the purpose of enhancing the communication and clarification of study-related matters, as well as facilitating the sharing of summarized findings.

CHAPTER 4. Results

This chapter endeavors to address the research questions delineated in section 2.5, namely, the interconnections between motivation, vocabulary learning strategies (VLS) and vocabulary knowledge (VK) (research question 1), and the contributions of different forms of motivation and VLS to VK (research question 2). First, the descriptive statistics of the target variables are displayed in section 4.1, followed by evaluations of the validity of all the measurement models in section 4.2. The subsequent three sections provide a description of the results obtained from three models constructed to address the aforementioned research questions. The contribution of motivation and VLS to VK is described in section 4.3, whereas the contributions of different types of motivation and VLS to VK are reported separately in sections 4.4 and 4.5. Lastly, the findings are summarized in section 4.6.

4.1 Descriptive statistics

Table 2 shows the means, standard deviations, internal reliability, normality test results and sample items for the observed variables. In Model 1, as elucidated in section 3.1, the variables intrinsic motivation (IM) and extrinsic motivation (EM) were considered as observed variables, aligning with Zhang et al.'s (2017) study. Thus, their means were derived by averaging their respective indicators. These composite scores were subsequently employed to conduct Model 1 analysis. According to the results, both IM and EM along with other directly measured variables, exhibited scores above the midpoint of the 5-point Likert scale. The average VK score, obtained from 120 questions, was 69.48 (SD=29.39), surpassing the midpoint of the maximum scale. IM, comprising nine items, demonstrated strong internal consistency with a Cronbach's alpha coefficient of .92. This construct encompassed three indicators, namely knowledge, accomplishment, and stimulation, with individual Cronbach's alpha values ranging from .77 to .78, indicating satisfactory internal reliability. Similarly, the internal reliability of EM (nine items) also reached an acceptable level with an overall Cronbach's alpha coefficient of .87. The construct comprised external regulation, introjected regulation, and identified regulation as its three indicators, the internal reliability of which ranged from .72 to .76. The reliability of the five VLS indicators (i.e., determination, social, memory, cognitive and metacognitive strategies) ranged from .66 to .90. Therefore, all observed variables attained an acceptable level of reliability (Hulin, Netemeyer, &

Cudeck, 2001). All variables exhibited a normal distribution, supported by their skewness and kurtosis falling within the range of -2 to 2 (Brown, 2006).

Table 2. Means, standard deviations, internal reliability, normality test results and sample items for observed variables

	Mean (SD)	Items	α	Skewness (SE)	Kurtosis (SE)	Sample Item
VK	69.48 (29.39)	120	—	-.70 (.20)	-.36 (.40)	—
IM	3.28 (.90)	9	.92	-.31 (.20)	.31 (.40)	—
KNOW	3.31 (.95)	3	.78	-.17 (.20)	-.14 (.40)	For the pleasure that I experience in knowing more about the literature of the English group
ACCOM	3.30 (.98)	3	.77	-.32 (.20)	-.21 (.40)	For the pleasure I experience when surpassing myself in my English studies
STIMU	3.24 (.98)	3	.77	-.30 (.20)	-.00 (.40)	For the “high” I feel when hearing foreign languages spoken
EM	3.37 (.80)	9	.87	-.33 (.20)	1.10 (.40)	—
EXTER	3.25 (.95)	3	.75	-.31 (.20)	.02 (.40)	Because I have the impression that it is expected of me
INTRO	3.21 (.97)	3	.72	-.29 (.20)	-.03 (.40)	Because I would feel ashamed if I couldn’t speak to my friends from the English community in English
IDEN	3.59 (.91)	3	.76	-.55 (.20)	.54 (.40)	Because I choose to be the

						kind of person who can speak more than one language
DET	3.30 (.54)	9	.68	.20 (.20)	1.20 (.40)	Analyse part of speech
SOC	3.01 (.73)	8	.84	-.35 (.20)	.40 (.40)	Ask teacher for an L1 translation
MEM	3.24 (.58)	24	.90	.22 (.20)	1.23 (.40)	Connect word to a personal experience
COG	3.23 (.63)	9	.76	.25 (.20)	.45 (.40)	Verbal repetition
MET	3.40 (.71)	5	.66	-.44 (.20)	1.64 (.40)	Testing oneself with word tests

Note. VK=vocabulary knowledge; IM=intrinsic motivation; KNOW=knowledge; ACCOM=accomplishment; STIMU=stimulation; EM=extrinsic motivation; EXTER=external regulation; INTRO=introjected regulation; IDEN=identified regulation; DET=determination strategies; SOC=social strategies; MEM=memory strategies; COG=cognitive strategies; MET=metacognitive strategies

4.2 Validity of measurement models

The validity of the measurement models was assessed to ensure that the selected indicators measured the constructs of interest (Kelley, 1927). Prior to conducting a full structural equation modelling (SEM) analysis, a series of assessments were conducted to ensure that all latent variables in the measurement models had no crossover with each other (i.e., discriminant validity; Cronbach & Meehl, 1955). Additionally, these measurements also aimed to verify that the indicators exclusively loaded on the expected variable (i.e., convergent validity; *ibid*). Table 3 presents the results indicating that the Average Variance Extracted (AVE) for all latent variables in the measurement models exceeded the threshold of .5, and the Composite Reliability (CR) values were all larger than .7. These findings suggest an acceptable level of convergent validity for the variables under investigation (Fornell-Larcker, 1981; Hair et al, 2009). With regards to discriminant validity, as illustrated in Table 4, the square roots of the AVE for motivation and VLS were .88 and .78, respectively, both of which were larger than the correlation between motivation and VLS (.60). In

the Model 2 and 3 sections of Table 4, it is observed that the relationships between the square roots of the AVE and the correlations involving the relevant constructs (i.e., IM and VLS; EM and VLS) remained consistent with the results in Model 1, revealing that the square roots of the AVE were greater than the correlations. Therefore, the results support the discriminant validity of the variables (Fornell-Larcker, 1981). In addition, all standardized factor loadings were statistically significant ($p < .001$), with values ranging from .58 to .95 (see Table 3). Detailed reporting of these factor loadings will be provided in the subsequent three sections. Thus, all the latent variables in Model 1, 2 and 3 were sufficiently represented by their respective indicator variables with adequate statistical power (Hair et al, 2009). The confirmation of the latent traits and their corresponding indicators provides researchers with the necessary validation to proceed with the main SEM analysis (see METHODOLOGY for more details).

Table 3. Assessment of the measurement models: path coefficients, convergent validity (AVE & CR) for Model 1, Model 2 and Model 3

Construct	Indicator	β	B	p	AVE	CR
Model 1						
Motivation	IM	.83	1.03	<.001	.76	.86
	EM	.91	1.00	<.001		
VLS	DET	.83	1.00	<.001	.61	.88
	SOC	.72	1.17	<.001		
	MEM	.95	1.21	<.001		
	COG	.76	1.06	<.001		
	MET	.59	.92	<.001		
Model 2						
IM	KNOW	.86	.90	<.001	.80	.93

	ACCOM	.93	1.00	<.001		
	STIMU	.90	.97	<.001		
VLS	DET	.83	1.00	<.001	.60	.88
	SOC	.72	1.17	<.001		
	MEM	.95	1.22	<.001		
	COG	.76	1.06	<.001		
	MET	.58	.92	<.001		

Model 3

EM	EXTER	.84	1.22	<.001	.63	.84
	INTRO	.83	1.23	<.001		
	IDEN	.71	1.00	<.001		
VLS	DET	.83	1.00	<.001	.60	.88
	SOC	.72	1.17	<.001		
	MEM	.95	1.22	<.001		
	COG	.76	1.06	<.001		
	MET	.58	.91	<.001		

Note. AVE=average variance extracted; CR=composite reliability; IM=intrinsic motivation; EM=extrinsic motivation; VLS=vocabulary learning strategies; DET=determination strategies; SOC=social strategies; MEM=memory strategies; COG=cognitive strategies; MET=metacognitive strategies; KNOW=knowledge; ACCOM=accomplishment; STIMU=stimulation; EXTER=external regulation; INTRO=introjected regulation; IDEN=identified regulation

Table 4. Assessment of the measurement models: discriminant validity and correlations for Model 1, Model 2 and Model 3

	Construct	Correlation matrix	
Model 1		Motivation	VLS

	Motivation	(.88)	
	VLS	.60	(.78)
Model 2		IM	VLS
	IM	(.89)	
	VLS	.51	(.77)
Model 3		EM	VLS
	EM	(.79)	
	VLS	.61	(.77)

Note. Diagonals in parentheses are square roots of the AVE from observed variables (items); off-diagonals are correlations between constructs. VLS=vocabulary learning strategies; IM=intrinsic motivation; EM=extrinsic motivation

4.3 Contribution of motivation and VLS to VK

To answer the first research question pertaining to the impact of motivation and VLS on VK, a SEM analysis was conducted. Table 5 presents eight commonly used model fit indices for the SEM. Regarding Model 1, the results indicated that seven out of the eight indices met the criteria for acceptable levels of fit: $\chi^2/df=1.92$ ($\chi^2=30.58$, $df=18$, $p<.05$), GFI=.94, CFI=.94, TLI=.96, IFI=.97, NFI=.94, RMSEA=.08. However, AGFI, the remaining one index, fell slightly short of acceptable threshold at .88. In SEM, it is not uncommon for some indices to deviate from the overall trend (Tseng & Schmitt, 2008). Thus, based on the strength of the fit indices, it is reasonable to interpret the regression coefficients in the model with confidence (Byrne, 2001).

Table 5. Model fit indices and acceptable levels for Model 1, Model 2 and Model 3

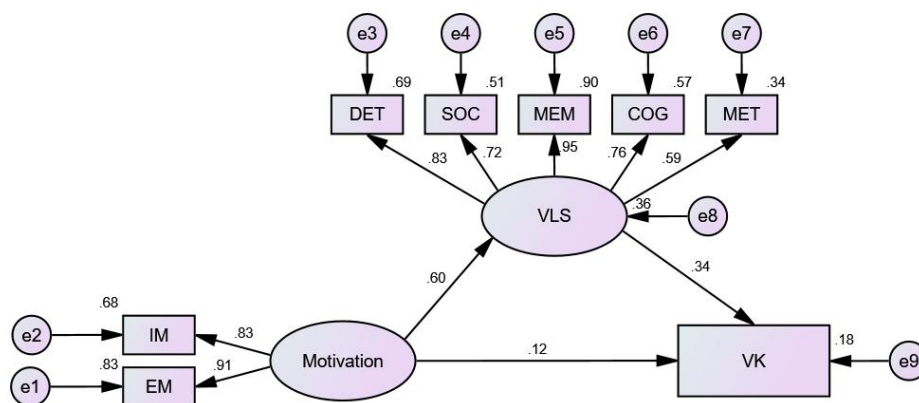
	χ^2/df	GFI	AGFI	CFI	TLI	IFI	NFI	RMSEA
Acceptable Level	<3	>.90	>.90	>.90	>.90	>.90	>.90	<.08
Model 1	1.92	.94	.88	.94	.96	.97	.94	.08

Model 2	1.75	.93	.88	.98	.97	.98	.95	.07
Model 3	2.96	.90	.81	.93	.90	.93	.90	.12

Note. df=degree of freedom; GFI=goodness-of-fit index; AGFI=adjusted goodness-of-fit index; CFI=comparative fit index; TLI=Tucker–Lewis index; IFI=incremental fit index; NFI=normed fit index; RMSEA=root mean square error of approximation.

As depicted in Figure 1, the coefficients on the regression paths in Model 1 are all positive, indicating a positive predictive power of an independent variable over a dependent variable. The paths with coefficients are summarized in the Model 1 section of Table 3. IM ($\beta=.83$, $p<.001$) and EM ($\beta=.91$, $p<.001$) both significantly loaded on the latent variable (i.e., motivation); the observed variables of VLS also demonstrated strong loadings from five indicators: determination ($\beta=.83$, $p<.001$), social ($\beta=.72$, $p<.001$), memory ($\beta=.95$, $p<.001$), cognitive ($\beta=.76$, $p<.001$) and metacognitive strategies ($\beta=.59$, $p<.001$). These findings suggest a significant relationship between the observed variables and their respective latent variables in Model 1.

Figure 1. The structural equation model of the relationship between motivation, VLS and VK



Note. IM=intrinsic motivation; EM=extrinsic motivation; VLS=vocabulary learning strategies; DET=determination strategies; SOC=social strategies; MEM=memory strategies; COG=cognitive strategies; MET=metacognitive strategies; VK=vocabulary knowledge

Table 6 shows the path coefficients of motivation and VLS on VK, allowing for an assessment of whether VLS mediated the association between motivation and VK. The findings reported in the Model 1 section of Table 6 indicated that motivation had a significantly positive effect on VLS ($\beta=.60$, $p<.05$), and VLS demonstrated a significantly positive effect on VK ($\beta=.34$, $p<.05$). Motivation had a significant total effect of .32 ($p<.05$) on VK, including a significant indirect effect of .21 ($p<.05$). Further analysis employing bootstrapping (see section 3.6) revealed that the unstandardized indirect effect had a bias-corrected 95% confidence interval ranging from 2.01 to 18.57. Conversely, the corresponding figures for the direct effect ranged from -10.38 to 20.11. These two ranges further confirmed the statistically significant nature of the indirect effect, while highlighting that there was no direct relationship between motivation and VK. As the result of the direct effect did not reach statistical significance, it can be concluded that the effect of motivation on VK was fully mediated by VLS, and the mediating effect accounted for a substantial 63.66% of the total effect size.

Table 6. Path coefficients, unstandardized bias-corrected bootstrap 95% confidence intervals and effect sizes for Model 1, Model 2 and Model 3

	β (SE)	B (SE)	p	Unstandardized Bias-corrected Bootstrap 95% CI		Effect size
				Lower	Upper	
Model 1						
Total effects						100%
Motivation→VLS	.60(.09)	.38(.09)	.001	.22	.58	
VLS→VK	.34(.14)	22.09(8.72)	.016	3.38	38.48	
Motivation→VK	.32(.14)	13.00 (6.07)	.031	1.27	24.47	
Direct effects						36.34%
Motivation→VLS	.60(.09)	.38(.09)	.001	.22	.58	

VLS→VK	.34(.14)	22.09(8.72)	.016	3.38	38.48	
Motivation→VK	.12(.19)	4.73(7.86)	.533	-10.38	20.11	
Indirect effects						63.66%
Motivation→VK	.21(.10)	8.28(4.18)	.008	2.01	18.57	
Model 2						
Total effects						100%
IM→VLS	.51(.10)	.25(.06)	.001	.13	.38	
VLS→VK	.34(.11)	22.18(6.92)	.001	7.90	36.14	
IM→VK	.31(.12)	10.01(3.84)	.015	2.29	17.11	
Direct effects						43.87%
IM→VLS	.51(.10)	.25(.06)	.001	.13	.38	
VLS→VK	.34(.11)	22.18(6.92)	.001	7.90	36.14	
IM→VK	.14(.14)	4.40(4.69)	.340	-5.58	12.63	
Indirect effects						56.13%
IM→VK	.17(.07)	5.62(2.53)	.001	1.80	12.65	
Model 3						
Total effects						100%
EM→VLS	.61(.08)	.42(.12)	.001	.26	.70	
VLS→VK	.34(.14)	22.12(8.89)	.013	4.68	39.87	
EM→VK	.32(.13)	14.49(6.03)	.032	1.62	25.57	
Direct effects						36.02%
EM→VLS	.61(.08)	.42(.12)	.001	.26	.71	
VLS→VK	.34(.14)	22.12(8.89)	.013	4.68	39.87	
EM→VK	.12(.19)	5.22(8.90)	.587	-16.51	19.87	
Indirect effects						63.98%

EM→VK	.21(.10)	9.27(5.47)	.010	1.92	24.08
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Note. Some total effect values do not add up because of rounding off. CI=confident interval; VLS=vocabulary learning strategies; VK=vocabulary knowledge; IM=intrinsic motivation; EM=extrinsic motivation

4.4 Contribution of IM and VLS to VK

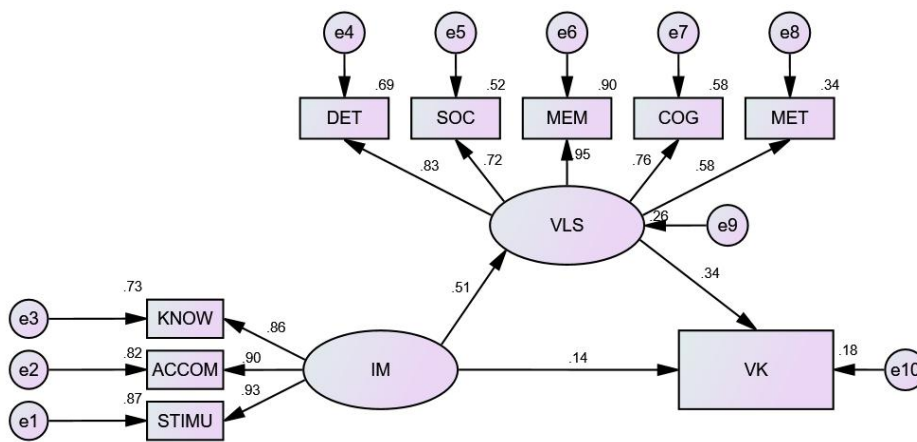
Subsequently, the investigation sought to ascertain whether IM and EM functioned in a comparable manner in the process of vocabulary learning. Model 2, as illustrated in Figure 2, was established to test the influence of IM and VLS on VK. The model displayed satisfactory fit across seven indices, including $\chi^2/df=1.75$ ($\chi^2=43.69$, $df=25$, $p<.05$), GFI=.93, CFI=.98, TLI=.97, IFI=.98, NFI=.95, and RMSEA=.07. However, it is worth noting that AGFI slightly fell below the acceptable threshold, with a value of .88. As previously mentioned, it is well-established in the literature that certain indices may not adhere to the majority pattern in SEM analyses (Tseng & Schmitt, 2008). Therefore, there is strong evidence that the model demonstrated a good overall fit with the empirical data.

The Model 2 section of Table 3 presents the standardized coefficients of the measurement model. Knowledge, stimulation, and accomplishment all loaded significantly on IM, with factor loadings of .86 ($p<.001$), .93 ($p<.001$) and .90 ($p<.001$), respectively. Similarly, determination, social, memory, cognitive and metacognitive learning strategies also exhibited strong loadings on VLS, with factor loadings of .83 ($p<.001$), .72 ($p<.001$), .95 ($p<.001$), .76 ($p<.001$) and .58 ($p<.001$), respectively. These findings suggest that these indicators contributed meaningfully to the constructs of both IM and VLS in Model 2.

As evidenced in Model 2 of Table 6, IM had a significantly positive effect on VLS, and similarly VLS demonstrated a significantly positive impact on VK, with the standardized coefficients (β) of .51 ($p<.05$) and .34 ($p<.05$), respectively. IM exerted a significant total effect of .31 ($p<.05$) on VK. There was no direct effect of IM on VK ($p>.05$), as indicated by the unstandardized bias-corrected 95% confidence interval ranging from -5.58 to 12.63. However, the bootstrapped standardized indirect effect of IM on VK through VLS was significant ($\beta=.17$, $p<.05$), with the

unstandardized bias-corrected 95% confidence interval ranging from 1.80 to 12.65. In parallel to the results of the first research question, IM had a significant indirect effect on VK, whereas there was no direct effect. Thus, VLS can be concluded to have fully mediated the positive effect of IM on VK, explaining an effect size of 56.13%.

Figure 2. The structural equation model of the relationship between IM, VLS and VK



Note. IM=intrinsic motivation; KNOW=knowledge; ACCOM=accomplishment; STIMU=stimulation; VLS=vocabulary learning strategies; DET=determination strategies; SOC=social strategies; MEM=memory strategies; COG=cognitive strategies; MET=metacognitive strategies; VK=vocabulary knowledge

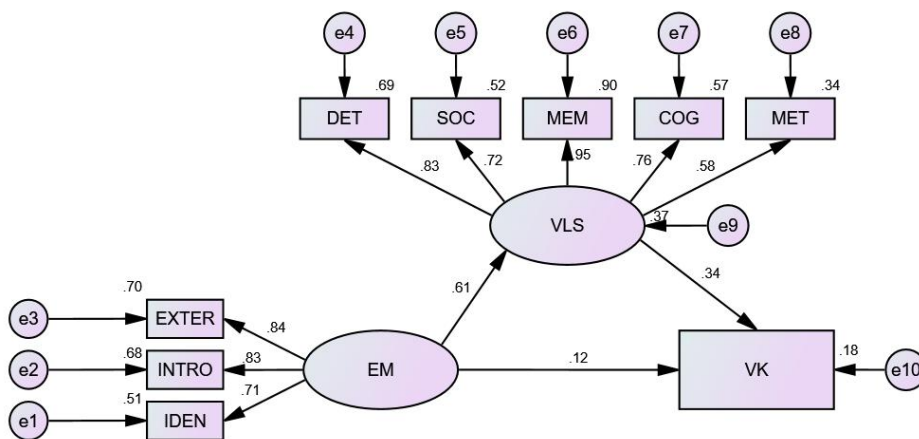
4.5 Contribution of EM and VLS to VK

A similar structural model (Model 3), as illustrated in Figure 3, was constructed to examine the relationship between EM, VLS, and VK. The evaluation of model fit indicated that six out of eight structural model fit indices supported the suitability of the model (see the Model 3 section of Table 5). These indices, including χ^2/df , GFI, CFI, TLI, IFI, and NFI, yielded values of 2.96 ($\chi^2=73.95$, $df=25$, $p<.001$), .93, .93, .90, .93 and .90, respectively, each of which either reached or exceeded the acceptable fit thresholds. The remaining two fit indices (i.e., AGFI=.81 and RMSEA=.12) were both in close proximity to the desired thresholds. Therefore, based on the results of the fit indices and their proximity to the predetermined

thresholds, the model can be deemed as a satisfactory overall fit with the empirical data.

The Model 3 section of Table 3 displays the standardized coefficients of the measurement model for EM and VLS. Regarding EM, all indicators loaded significantly (external regulation, $\beta=.84$, $p<.001$; introjected regulation, $\beta=.83$, $p<.001$; and identified regulation, $\beta=.71$, $p<.001$). Furthermore, in the measurement model of VLS, determination, social, memory, cognitive and metacognitive strategies also demonstrated significant loadings, consistent with the factor loadings observed in Model 2.

Figure 3. The structural equation model of the relationship between EM, VLS and VK.



EM=extrinsic motivation; EXTER=external regulation; INTRO=introjected regulation; IDEN=identified regulation; VLS=vocabulary learning strategies; DET=determination strategies; SOC=social strategies; MEM=memory strategies; COG=cognitive strategies; MET=metacognitive strategies; VK=vocabulary knowledge

In a similar fashion to Model 2, the path coefficients of Model 3 in Table 6 reveal that EM had a significantly positive effect on VLS ($\beta=.61$, $p<.05$) and VLS also positively predicted VK ($\beta=.34$, $p>.05$). The total effect of EM on VK was significant, with a coefficient of .32 ($p<.05$). However, there was no direct effect of EM on VK

($p > .05$), as revealed by the unstandardized bias-corrected 95% confidence interval ranging from -16.51 to 19.87. Conversely, through the application of bootstrapping, the standardized indirect effect of EM on VK through VLS was statistically significant ($\beta = .21$, $p < .001$). The unstandardised bias-corrected 95% confidence interval for the indirect effect ranged from 1.92 to 24.08. Considering that there was no direct relationship between EM and VK, VLS can be concluded to have fully mediated the positive effect of EM on VK. Moreover, the effect size of the mediation was 63.98%, indicating that VLS accounted for a substantial portion of the total effect of EM on VK.

4.6 Summary of the findings

In summary, this study effectively addressed the two foregoing research questions by constructing three distinct structural models, all of which exhibited good model fit. The results obtained from Model 1 demonstrated that motivation predicted VK indirectly rather than directly, yielding a complete mediating effect of motivation on VK through VLS and a notable effect size of 63.66%. In addition, both the effects of motivation on VLS and VLS on VK were significant and positive. These findings collectively addressed the first research question.

Model 2 and Model 3 were combined to provide an answer to the second research question. The findings indicate that VLS fully mediated the positive effect of IM on VK, with a relatively smaller effect size of 56.13%. However, the largest effect size of 63.98% was observed when the influence of EM on VK was fully mediated by VLS. The complete mediating effects of VLS also indicated that neither IM nor EM predicted VK directly. In addition, the effects of IM on VLS and VLS on VK were significant and positive, and the similar relationships could be found while EM predicted VLS and VLS predicted VK. These findings constituted the answer to the second research question.

Considering all the findings obtained from three structural models, it becomes evident that VLS played a crucial role as a complete mediator in the relationship between motivational factors (i.e., IM and EM) and VK. In addition, motivation, IM, EM all had significant influence on VLS, and the same significance could be found when VLS influenced VK. However, the impact of IM on VK mediated through VLS was not as strong compared to that of EM on VK when mediated through VLS.

CHAPTER 5. Discussion

The study investigated the relationships between motivation, vocabulary learning strategy (VLS), and second language (L2) vocabulary knowledge (VK) among learners of English as a foreign language (EFL) as well as whether the effect of extrinsic motivation (EM) on VK is mediated by VLS in a comparable manner to the effect of intrinsic motivation (IM) on VK. The study is important because it seeks to provide empirical evidence to supplement the limited number of existing studies in this domain and also examine the extent to which the conclusions drawn from previous research can be generalized to older age groups and people from lower socio-economic status (SES) backgrounds. Hence, two research questions were formulated: (1) What are the relationships between motivation, VLS and VK? and (2) To what extent do IM and EM function differently with VLS and VK?

This chapter aims to interpret the three findings (section 4.6) obtained in the present study. Therefore, the chapter is structured into three sections, with section 5.1 dedicated to examining the effects of motivation and VLS on VK. The subsequent two sections delve into a detailed discussion of how VLS as a complete mediator exerted its influence on the relationships between IM/EM and VK. Section 5.4 is the summary, followed by limitations and future studies in section 5.5.

5.1 Effects of motivation and VLS on VK

Within this section, a more detailed breakdown is provided through two distinct subsections. Section 5.1.1 focuses on interpreting both the direct and indirect effects of motivation on VK, specifically emphasizing the complete mediating role of VLS in this relationship. On the other hand, section 5.1.2 delves into an in-depth analysis of the influence exerted by VLS on VK.

5.1.1 Direct and indirect effects of motivation on VK

The first research question aimed to investigate the predictive relationship between motivation, VLS and vocabulary size. The findings of the present study indicated no direct relationship between motivation and VK. This is not aligned with the consensus achieved by a multitude of prior studies, regarding motivation as a critical determinant of success in language learning (Csizer & Dörnyei, 2005; Elley, 1989; Gardner, 1985; Gardner & MacIntyre, 1991; Noels et al., 1999, 2001). Some studies preceded the present study in reporting the non-existent direct effect of motivation on

learning outcomes (e.g., Kim, Park & Cozart, 2014), including EFL learning (e.g., Lin, Zhang & Zheng, 2017). Lin et al. (2017), for instance, examined the correlation between motivation and language learning outcomes based on data collected from 466 online language students at the high school level. They found that motivational variables (i.e., IM and EM) did not significantly predict any online learning outcomes (i.e., satisfaction, perceived progress and final grades). However, the study acknowledged that the online learning settings might possess distinct characteristics from traditional educational environments for the presence of additional mediating variables such as emotional experiences (Kim et al., 2014).

Likewise, the present findings warrant careful consideration when attempting to examine the importance of motivation in language learning. The results should be interpreted as suggesting that mechanisms through which motivation affects vocabulary learning in a non-school context may differ from the mechanisms observed in secondary-level or undergraduate courses. Non-school settings may involve the presence of additional mediating variables, especially considering individuals' diverse prior knowledge. It is worth noting that prior knowledge can significantly enhance memory processes such as encoding, consolidation and retrieval of events and factual information, and thus facilitate knowledge acquisition (Shing & Brod, 2016). In the current study, although the participants shared similar academic backgrounds, as most of them held a bachelor's or master's degree, their prior linguistic knowledge varied due to the discrepancy in their weekly exposure to English. Another factor which could become a possible explanation may reside in the specific region that the study selected. As outlined in section 2.5, the study focused on Jilin province, which is characterized by a lower SES compared to the populations residing in the southern regions of the country. Lower SES can impose limitations on individuals' access to educational resources, including a reduced availability of books (e.g., Bradley et al., 2001), as well as potentially impacting the quality and diversity of available books (e.g., Froiland et al., 2013; McGill-Franzen et al., 2002). Individuals from lower-SES backgrounds, such as those residing in the selected areas in this study, may encounter limited opportunities to visit high-quality libraries. This lack of access to well-equipped libraries can potentially hinder their exposure to diverse reading materials, which are known to stimulate vocabulary expansion and language development (Neuman & Celano, 2001). Many empirical studies have also

shown the positive correlation between SES and English proficiency (e.g., Kieffer, 2010; Lorenzo, Granados & Rico, 2021; Muttaqin, Chuang, Lin & Cheng, 2022). Hence, participants in the study may experience adverse impacts on their language learning due to a lower-SES environment, irrespective of their motivation levels. Other factors, notwithstanding their irrelevance with adult EFL learners in non-school settings, may still be considered as mediators, such as personality traits. According to Dörnyei (2005), personality factors play a significant role in the learning process in general and in SLA in particular. They are often viewed as “powerful modifying variables” (p. 24) which “shape the way people respond to their learning environment” (p. 30). Numerous studies exploring the relationship between personality factors and language learning also provided the evidence that supports these assertions (e.g., Hurd, 2006). Summing up, motivation may be intertwined with various variables, but the present study lacks sufficient data to confirm or refute these variable-related statements.

Although direct prediction of VK by motivation was not observed in the study, the structural equation modeling (SEM) analysis revealed an indirect relationship between motivation and L2 vocabulary learning, mediated by VLS. This suggests that motivation may have played a crucial role in influencing L2 VK by encouraging learners to employ a variety of VLS (Lee, 2020). The mediating effect of VLS was also found consistent with relevant previous studies (e.g., Lee, et al., 2022; Zhang et al., 2017). One possible explanation may be that motivated learners are more likely to actively and voluntarily engage in their learning processes by seeking out and employing available resources at their disposal (Zimmerman, 2002), that is, VLS in this particular context. Motivational factors are commonly regarded as prerequisites for self-regulated learning (Ryan & Deci, 2000), and motivated learners subsequently employ a great range of cognitive and metacognitive strategies to regulate their learning processes (Schmidt & Watanabe, 2001; Zimmerman & Schunk, 2008; Zimmerman, 2008). As Zimmerman (2008) emphasized self-regulated learners engage in activities such as planning, goal-setting, organizing their learning materials, seeking out relevant resources, evaluating their learning outcomes at different stages during knowledge acquisition. Furthermore, the effects of motivation on VLS and VLS on VK, representing two paths of the indirect effect, were both statistically significant and positive. This finding is consistent with previous research that has

consistently demonstrated a positive relationship between motivation and the use of L2 strategies (e.g., Vandergrift, 2005; Wharton, 2000), indicating that highly motivated students are more inclined to employ various learning strategies in L2 learning. However, Tseng and Schmitt (2008) did not observe a direct link between motivation and strategy use. This discrepancy might be attributed to the theoretical model they employed, which divided the concept of strategy use into two distinct stages: quantity and quality stages of strategy use. The splitting of strategy use into separate stages might have potentially diminished the direct influence of motivation compared to a conceptualization that treats strategic behavior as a unified construct. Therefore, it can be inferred that motivation generally has a positive and significant impact on the use of learning strategies, as supported by the majority of previous studies and the current study. In a similar vein, extensive empirical research examining the relationship between learning strategies and L2 achievement has consistently found a positive association (e.g., Barcroft, 2009; Lai, 2009; Tseng & Schmitt, 2008), indicating that a higher level of strategy use is correlated with greater learning achievement. The positive relationship validated by many studies is in concordance with the findings of the present study, which will be further interpreted in section 5.1.2, especially regarding the relationship between VLS and VK. However, it is worth noting that the current study, in contrast to the aforementioned two similar studies (Lee, et al., 2022; Zhang et al., 2017), identified a complete mediation rather than a partial mediation as there was no direct effect of motivation on VK.

5.1.2 Effect of VLS on VK

Unlike motivation, VLS was found to be predictive of L2 VK, which is in accordance with many prior relevant studies (e.g., Fan, 2020; Gu & Johnson, 1996; Zhang & Lu, 2015). A close scrutiny of Table 2 showed that the use of strategies was at a moderate level, also in line with many previous findings (e.g., Seker, 2016; Zhang et al., 2017). The present study corroborates such findings in the case of adult EFL learners. Further analysis revealed that memory strategies (.95) loaded on VLS to the greatest extent, indicating a strong association, whereas metacognitive strategies (.59) had the lowest loading, suggesting a comparatively weaker relationship with VLS. The result regarding memory strategies aligns with previous studies exploring analogous relationships between motivation, VLS and VK, whereas the finding pertaining to metacognitive strategies is inconsistent (e.g., Lee et al., 2022; Zhang et al., 2017). In

Lee et al.'s (2022) study, VLS was divided into three subcategories: memory, cognitive and metacognitive strategies, the questionnaire of which was also partially adapted from Schmitt's (1997) inventory, similar to the questionnaire employed in the current study. The findings indicated a robust loading of memory on VLS, as evidenced by a coefficient of .90, which closely resembled the results of the present study. However, both metacognitive and cognitive strategies exhibited comparable loadings, with coefficients of .70 and .80 respectively, which deviated significantly from the findings of the present study. In Zhang et al.'s (2017) study, the loadings of cognitive (.92) and metacognitive strategies (.95) were also comparable. Cognitive and metacognitive strategies are widely recognized as crucial components for effective learning, as they are associated with higher levels of language proficiency (O'Malley & Chamot, 1990; Peacock & Ho, 2003; Wharton, 2000). Moreover, these two strategies are also often used in conjunction to mutually reinforce each other (O'Malley & Chamot, 1990).

Although the absence of qualitative instruments makes it difficult to provide a definite explanation for this finding, it can be posited that the participants of the present study possessed a relatively greater amount of L2 learning experience compared to adolescent and undergraduate L2 learners (e.g., Lee et al., 2022; Zhang et al., 2017). This may have influenced their preference for specific vocabulary strategies. Moreover, adults, due to their cognitive maturation, are likely to have developed more advanced cognitive abilities (Gualtieri & Finn, 2022). They can leverage their existing knowledge and experiences to form connections with new vocabulary. According to Schmitt (1997), memory strategies, used for consolidating a word once it has been encountered, refer to learning vocabulary by executing manipulative mental processing. Most of these strategies entail relating the target word with some previously learned knowledge, employing imagery or grouping techniques, such as connecting a word to a personal experience or incorporating it into a narrative framework (ibid). Thus, Memory strategies allow adult learners to leverage their extensive cognitive resources to facilitate vocabulary retention. Another possible explanation could be the adults' motivation to optimize their learning efficiency. Adult learners often face constraints in terms of time and resources due to work, family obligations, and other responsibilities. Memory strategies are viewed as efficient techniques for swiftly acquiring and retaining

vocabulary, as compared to cognitive strategies like verbal or written repetition, or metacognitive strategies such as studying a word over an extended period. In line with Brown's (2000, p.86) assertion, "a meaningfully learnt, subsumed item has far greater potential for retention." Through the process of integration into cognitive frameworks such as imagery and grouping, subsumed items enhance retention, aligning with adults' requirement for efficient learning. In contrast, metacognitive strategies are adopted to monitor and regulate their own learning, providing them with an overview of the learning process in general, which encompass practice such as continuing to study word over time and self-testing through word-based assessments (Schmitt, 1997). The reason for its relatively weak association with overall VLS may be adults' time constraints and competing priorities, as previously stated. Their limited time availability may make it challenging to engage in metacognitive activities, which require reflection, planning, and self-assessment. In addition, the lack of intensive training and the absence of a structured academic environment as typically found in formal schooling, may present challenges for adults in effectively deploying metacognitive strategies. In a traditional school setting, students are often exposed to regular assessments and exams, which create a sense of urgency and necessity for studying and reviewing material over time. However, as adults engage in language learning outside of a formal educational setting, they may not feel the same pressure to adhere to testing or studying routines. As a result, metacognitive strategies in the current study demonstrated the weakest association.

5.2 Effect of IM on VK

The second research question addressed whether different types of motivation function differently in relation to VLS and L2 VK. The findings revealed that VLS mediated the impacts of IM and EM on VK to a similar extent. Regarding IM, the study found no direct influence on VK, which challenges the notion that IM is a fundamental component of L2 learning (e.g., Noels et al., 1999; Pae, 2008). Additionally, the finding is incongruent with prior studies similar to the current one, which explored the relationship between IM, VLS and VK (e.g., Lee et al., 2022; Zhang et al., 2017). Despite the prevailing consensus in empirical studies supporting a positive and significant relationship between IM and learning outcomes, a minority still hold a divergent perspective. For instance, Lin et al. (2017) reported no relationship between IM and learning outcomes (i.e., satisfaction, perceived progress

and final grades). However, as stated in section 5.1.1, vocabulary learning is a multifaceted process that involves various cognitive and contextual factors. Therefore, IM alone may not be sufficient to predict vocabulary learning outcomes, especially in the case of adults' EFL learners.

Nevertheless, IM did predict VK indirectly by means of its mediation through VLS. The mediating role of VLS in linking the effect of IM on VK is also consistent with relevant previous studies (e.g., Lee et al., 2022; Zhang et al., 2017). One plausible explanation for this finding can be drawn from the postulation of Ryan and Deci (2017), who argued that the most autonomous forms of motivation, including IM, would lead to adaptive behaviour. This implies that intrinsically motivated individuals would actively seek out useful resources to facilitate their learning; regulate the pace of their own learning; and derive satisfaction from tackling challenges and solving problems that arise as part of the learning process (Reeve, Ryan, Deci, & Jang, 2008). Eventually, the acquired strategies played a pivotal role. In addition, two paths of the indirect effect, namely the effects of IM on VLS and VLS on VK, were both significant and positive. This observation aligns with previous studies that have investigated the relationship between IM and L2 strategy usage, wherein a positive association has been consistently reported (e.g., Vandergrift, 2005; Zhang et al., 2017). In Vandergrift's (2005) study, which examined the relationship between motivation (i.e., amotivation, IM and EM), metacognition and proficiency in listening comprehension, there were more significant associations between various listening strategies and IM compared to EM. Thus, Vandergrift concluded that individuals who exhibited higher levels of IM were more likely to report employing these listening strategies. Regarding the second path of the indirect effect, which showed the influence of VLS on VK, it aligns with the discussion presented in section 5.1.2 and does not require further explanation. However, it is worth noting that the current study, in contrast to two similar aforementioned studies (Lee et al., 2022; Zhang et al., 2017), identified a complete mediation rather than a partial mediation due to the lack of effect of motivation on VK.

5.3 Effect of EM on VK

EM exhibited no predictive power in directly determining VK, mirroring the lack of direct effects of motivation and IM on VK. This finding is in line with many prior studies (e.g., Lin et al., 2017; Vandergrift, 2005). However, Noels et al.'s (2001)

study diverged from the present study in the relationship between EM and learning consequences (i.e., persistence in English study, motivational intensity, and course achievement). Although they did not discover significant correlations between two of extrinsic sub-scales (i.e., external regulation and introjected regulation) and any of the aforementioned learning outcomes, the results revealed that the remaining extrinsic sub-scale (i.e., identified regulation) was significantly correlated with motivational intensity and persistence in English study. The discrepancies between the current findings regarding the effects of EM and those of Noels et al. (2001) can be attributed to the contextual factors in which the participants were situated, which may affect individuals' autonomy (Deci & Ryan, 2012). Noels et al.'s study was conducted in California, where there is a significant Spanish-speaking population, and the purpose of L2 learning might revolve around effective communication within the community, rather than simply obtaining employment: a stark contrast to the Chinese context for English learning in the current research. Indeed, the positive impact of EM underscores the notion that motivational influences on L2-learning achievement can be highly sensitive to nuanced contextual variations. The study suggests that future investigations devote careful consideration to these subtleties, rather than hastily drawing conclusions regarding the overall impact of EM based solely on research conducted in non-L2 domains or limited to one or two specific L2 or foreign-language contexts.

Nonetheless, EM indirectly predicted L2 VK via VLS, corresponding to the results reported in Lee et al.'s (2022) and Zhang et al.'s (2017) studies. This finding indicates that EM may continue to encourage EFL learners to employ VLS in order to expand their English VK. One possible explanation for this observation is that extrinsically motivated learners are more attuned to the development of the environment as it may offer external rewards and incentives. Within the distinctive context of the L2 learning environment in China, the growth of the economy has generated a heightened requirement for individuals with competitive English proficiency. Consequently, this demand tends to foster elevated levels of EM among learners, as well as their proactive use of strategies that the study observed. In addition, the significant and positive effect of EM on VLS in the present study seemed to contrast with that of a previous study (Walker, Greene, & Mansell, 2006). The earlier study indicated that EM only predicted a superficial cognitive learning

strategy (memorization), rather than more meaningful ones. A possible explanation for the disparity may reside in the domain variance between these two studies. Walker et al. (2006) examined EM and strategy use among students enrolled in college-level classes (i.e., Educational Psychology and Career Exploration), while the focus of the study was adult EFL learners' L2 vocabulary performance. For these participants, extrinsic rewards such as career development and pay rise can serve as potent motivators. A close examination of the motivation questionnaire revealed that over 60% of the participants expressed their intention to learn English with the aim of obtaining "a more prestigious job", whereas those who did not aspire for a prestigious job only accounted for less than 20%. Therefore, it can be inferred that English learning was perceived as highly advantageous for their career progression, whereas the two courses in Walker et al.'s (2006) study were not regarded as high stakes. Thus, it would seem reasonable that in Walker et al.'s (2006) study, the students' EM to learn in these two courses might not have necessarily translated into active utilization of learning strategies. Contrary to the insignificant results of this one study, most studies on EM and L2 strategies have reported their positive relationship (e.g., Vandergrift, 2005; Zhang et al., 2017), indicating that students with high levels of EM are more inclined to employ various learning strategies in L2 learning endeavors.

5.4 Summary of the discussion

Overall, the results of this study highlight the significant contributions of motivation and VLS to the process of vocabulary learning in adult EFL learners. While motivation does not directly predict VK, its impact on VK is mediated by learners' VLS. Either intrinsically or extrinsically motivated learners were both likely to employ various strategies, which positively influenced VK. Nonetheless, it is crucial to acknowledge the contextual nuances and individual differences that may affect the interpretation of these findings.

5.5 Limitations and future studies

Several limitations of the present study need to be noted. First of all, with regard to the dimensions of the three variables under examination, namely motivation, VLS and VK, it is worth considering that alternative measurement dimensions could be employed or incorporated to enhance the comprehensiveness of these variables. Regarding VK, the study solely relied on vocabulary size as the singular indicator of students' VK. Given that vocabulary depth has frequently been taken into

consideration (e.g., Schmitt, 2008), and is closely associated with vocabulary size (Nurweni & Read, 1999; Schmitt & Meara, 1997), it would be advantageous to consider both dimensions of L2 VK in tandem (see Schmitt, 2014 for an in-depth review on this matter). Furthermore, certain aspects of VLS (e.g., attending to various facets of a target word) could be potentially linked to vocabulary depth, which refers to the extent of an individual's familiarity with a lexical item (Qian, 2002). Nation (2001) argued that the comprehension of a word encompasses not only its form, but its meaning and use. In light of the multifaceted nature of vocabulary depth, evaluation of this dimension has unsurprisingly included a wide array of factors, such as grammatical functions of words (Pigada & Schmitt, 2006; Schmitt, 1998), both syntagmatic and paradigmatic associations (Webb, 2007), and syntactic knowledge (ibid), among other factors. Notwithstanding the potential benefit of incorporating vocabulary depth as a means to enhance the measurement of the relationship between a wide range of VLS and L2 VK, it is beyond the scope of the current study. Although the gap has been filled by Lee et al's (2022) study, which investigated the structural relationships between motivation, VLS, and two components of L2 VK (i.e., size and depth) in adolescent EFL learners, potential disparities in these relationships among adult EFL learners remain unexplored. In terms of VLS, the items were evaluated based on a frequency scale that spanned from 'never use' to 'always use'. Hence, the psychometric nature of VLS manifested through its quantity rather than quality. According to traditional arguments in the literature, higher proficiency is believed to be associated with both a greater variety of strategies and more frequent utilization of those strategies (Oxford, 1989; Oxford & Crookall, 1989). Contrary to the traditional viewpoint, Tseng and Schmitt's (2008) model challenges the notion that the quantity of strategies used directly and positively impacts VK achievement while indicates that mastery of vocabulary learning tactics does. As pointed out by Ellis (1994), the widely held assumption that effective strategy use is synonymous with frequent strategy use is indeed questionable. Supporting the critique of using frequent strategy use as a sole measure of strategic competence, Nisbet, Tindall, and Arroyo (2005) have put forth a similar argument in their study. Hence, it is seemingly of more importance to understand when and why a specific strategy is employed in different vocabulary learning tasks than simply measuring its frequency, although the present study did demonstrate a significant effect of VLS, measured by frequency, on VK. Regarding motivation, researchers (e.g. Dörnyei, 2005; Norton, 2000; Ushioda,

2018) have recently redirected their focus from perceiving motivation as a fixed construct to conceptualizing it as a dynamic phenomenon that takes shape and evolves over time. The significance of time in L2 learning necessitates, as argued by Ortega and Iberri-Shea (2005), a heightened emphasis on longitudinal research, which is essential to gain a comprehensive understanding of how crucial processes develop overtime and how educational interventions can enhance their effectiveness. Nevertheless, the current study is limited in its ability to encompass the entirety of the various dimensions associated with the three variables under investigation.

Second, there might exist additional mediating factors, including but not limited to individuals' varying prior knowledge, SES and personality traits. These factors could potentially influence the relationships between motivation/IM/EM and VK, thereby introducing a potential source of inconsistency with findings of previous studies. A detailed discussion is provided in sections 5.1.1, 5.2 and 5.3. However, the present study lacks sufficient data to conduct an extensive quantitative analysis to either confirm or refute the effects of the aforementioned mediating variables. For example, concerning SES, the inclusion of a direct measure of SES and a comparison between individuals with low and high SES within the same study could offer more valuable insights. Additionally, the study could not provide a conclusive explanation for the weakest loading of metacognitive strategies on VLS due to the absence of qualitative instruments and data pertaining to relevant variables (e.g., cognitive ability), as mentioned in section 5.1.2. Therefore, investigating these variables falls beyond the intended scope of the current study.

Taking into account the aforementioned limitations, the study proposes the following recommendations for future research. First, it is advised to define and operationalize L2 VK more thoroughly, and different L2 vocabulary tests should be employed to evaluate its different facets. Nation's (2013) framework of L2 VK, which includes the dimensions of form, meaning and use, could be utilized. In addition, it is recommended to adopt a measuring method capturing both the quality and quantity of VLS and regarding motivation as a dynamic variable. Second, future studies should incorporate other mediating variables (e.g., prior knowledge, SES, personality traits) to further expand and refine the existing structural model. By considering these influential factors, a more comprehensive and nuanced understanding of the relationships within the model can be attained. It is also suggested to involve

qualitative instruments and cognition-related variables (e.g., aptitude, working memory) to provide a more explicit and convincing account of the results. Lastly, future research on this issue could test the proposed structural model in diverse social and cultural contexts, as well as across different domains within L2 learning. Examining the applicability of the model in varied contexts could contribute to the advancement of theoretical framework and practical implications across a broader spectrum of L2 learning environments.

CHAPTER 6. Conclusion

The present study examined the correlations between language learning motivation, vocabulary learning strategies (VLS), and second language (L2) vocabulary knowledge (VK) within the framework of self-regulated learning (SRL), by employing structural equation modelling (SEM) as the primary method of data analysis. The results revealed that motivation had an indirect rather than a direct influence on VK, resulting in a complete mediating effect of VLS on the relationship between motivation and VK. The effect size attained a noteworthy value of 63.66%. In addition, both the effects of motivation on VLS and VLS on VK were significant and positive. However, of the two types of motivation, the impact of intrinsic motivation (IM) on VK, when mediated through VLS, exhibited a relatively weaker effect size of 56.13%, compared to that of extrinsic motivation (EM) on VK, also mediated through VLS, which demonstrated a stronger effect size of 63.98%. The effects of IM and EM on VK were both completely mediated by VLS.

The findings make a theoretical contribution by enhancing the understanding of the interconnections between motivation, VLS and VK, shedding light on the separate roles played by IM and EM, particularly within the context of adult learners of English as a Foreign Language (EFL) who have graduated. From a pedagogical standpoint, an understanding of the intricacy associated with motivation and the mediating role of VLS can assist educators in gaining a clearer comprehension of not only the driving forces behind adult learners to acquire English vocabulary but also the additional factors requiring heightened attention in the learning process. Given that the motivation of adult learners, including both IM and EM, only indirectly predicted VK via their use of learning strategies, it becomes important for educators to acquaint adult EFL learners with a diverse range of strategies and subsequently encourage them to apply these strategies to their studies in more rational manner. In addition, it would be premature to dismiss the significance of motivation based on the lack of effect on VK in this study. On the contrary, educators should continue to motivate learners through both intrinsic and extrinsic means in order to stimulate their engagement in acquiring a broader range of strategies, which are likely to result in increased VK, as indicated by the findings. It is essential to acknowledge that when considering adult learners who have graduated and may face limited access to intensive instructional interventions, as compared to students in a conventional school

setting, their primary emphasis, especially when learning in the absence of a teacher, should be strategy use.

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Appendix 1. Participant Outreach

Invitation message sent in Wechat groups (English)

Hello everyone, I am XXXX. Currently, I am pursuing a Master's degree in Applied Linguistics and Second Language Acquisition at the University of Oxford. I am currently collecting questionnaire data for my master's thesis. If you are interested in learning strategies and vocabulary testing and meet the following four criteria: (1) aged 22 and above; (2) already graduated; (3) a native Chinese speaker; (4) primarily living and working in Jilin Province, China; (5) have no experience or have less than one year (including one year) of studying or working in an English-speaking country; (6) still actively learning or using English (no specific duration required), please scan the QR code to join the group and participate in the questionnaire survey. The questionnaire includes motivation and strategy survey as well as vocabulary testing. Thank you for your participation!

Invitation message sent in Wechat groups (Chinese)

大家好，我是XXXX。目前，我在牛津大学攻读应用语言学与二语习得专业的硕士学位。我正在进行硕士毕业论文的问卷数据收集工作。如果您对学习策略和词汇量测试感兴趣，并且符合以下四个条件：（1）年龄在22岁及以上；（2）已经完成学业；（3）以中文为母语；（4）主要生活和工作在中国吉林省地区；（5）没有或仅有一年以下（包括一年）的英语国家学习或工作背景；（6）仍在积极学习或使用英语（时长不限），请扫描二维码加入我们的群组，参与问卷调查。问卷内容包括动机和策略调查以及词汇量测试。感谢您的参与！

Appendix 2. Questionnaires

2.1 Motivation (English)

**The following English learning motivations, do they apply to you
(Not applicable at all; Somewhat applicable; Slightly applicable; Very applicable;
Extremely applicable)**

I learn English:

1. For the “high” feeling that I experience while speaking in English.
2. In order to get a more prestigious job later on.
3. For the satisfied feeling I get in finding out new things.
4. Because I choose to be the kind of person who can speak more than one language.
5. Because I would feel ashamed if I couldn’t speak to my friends from English community in their native tongue.
6. For the satisfaction I feel when I am in the process of accomplishing difficult exercises in English.
7. In order to have a better salary later on.
8. Because I enjoy the feeling of acquiring knowledge about English community and their way of life.
9. Because I would feel guilty if I didn’t know English.
10. Because I have the impression that it is expected of me.
11. For the pleasure that I experience in knowing more about the literature of English group.
12. For the pleasure I get from hearing English spoken by native English speakers.
13. Because I choose to be the kind of person who can speak English.
14. For the pleasure I experience when surpassing myself in my English studies.
15. To show that I can speak English.
16. For the “high” I feel when hearing foreign languages spoken.
17. For the enjoyment I experience when I grasp a difficult construct in English.
18. Because I think it is good for my personal development.

2.2 Motivation (Chinese)

以下英语学习**动机**是否符合你的情况

	一点也不符合	有点符合	一般符合	很符合	极其符合
1. 我学习英语是因为当我用英语说话时,我感到很开心	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2. 我学习英语是为了将来找到更有声望的工作	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3. 我学习英语是因为我在了解新事物时体会到满足感	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4. 我学习英语是因为我希望成为一个能说多种语言的人	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
5. 我学习英语是因为如果无法与说英语的人群进行交流,我会感到尴尬	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
6. 我学习英语是因为在做难题的过程中,我体验到了学习英语的乐趣	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
7. 我学习英语是为了以后有更高的薪水	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
8. 我学习英语是因为我喜欢了解英语社会群体及其生活方式	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
9. 我学习英语是因为如果我不懂英语,会有内疚感	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
10. 我学习英语是因为别人对我的期望	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
11. 我学习英语是因为我在了解英语文学作品方面体会到了愉悦感	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
12. 我学习英语是因为我听到英语母语者说英语时的愉悦	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
13. 我学习英语是因为我想成为一个会说英语的人	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
14. 我学习英语是因为在英语学习中超越自我时体会到的快乐	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
15. 我学习英语是为了证明我能够说一口流利的英语	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
16. 我学习英语是因为当我听到别人说外语时,我感到很开心	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
17. 我学习英语是因为在掌握英语中较难的概念时所体会到的乐趣	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
18. 我学习英语是因为这对我个人发展有好处	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

2.3 Vocabulary Learning Strategies (English)

When learning new vocabulary, please indicate the extent of your usage of the following vocabulary learning strategies (never use; occasionally use; moderately use; frequently use; always use)

1. Analyse part of speech
2. Analyse affixed and roots (e.g. television=tele+vi+sion)
3. Ask teacher for an L1 translation
4. Ask teacher for paraphrase or synonym of new word
5. Check for L1 cognate (e.g. tank & 坦克; bacon & 培根)
6. Ask teacher for a sentence including the new word
7. Analyse any available pictures or gestures
8. Guess from textural context
9. Bilingual dictionary
10. Ask classmates for meaning
11. monolingual dictionary
12. Word lists
13. Discover new meaning through group work activity
14. Flash cards

When reviewing vocabulary, please indicate the extent of your usage of the following vocabulary learning strategies (never use; occasionally use; moderately use; frequently use; always use)

1. Study and practice meaning in a group
2. Connect the word to its synonyms and antonyms
3. Group words together to study them
4. Study the spelling of a word
5. Memorizing words by associating them with relevant scenes, locations, and images
6. Use cognates in study (e.g. tank & 坦克; bacon & 培根)
7. Verbal repetition
8. Put English labels on physical objects
9. Use English-language media (songs, movies, newscasts, etc.)
10. Interact with native-speakers
11. Image word's meaning
12. Connect word to a personal experience
13. Associate the word with its coordinates (e.g. associate fruit words like 'apple' and 'pear' together)
14. Use 'scales' for gradable adjectives (e.g. huge/big/medium-sized/small/tiny)
15. Study the sound of a word
16. Underline initial letter of the word
17. Remember affixes and roots (e.g. television=tele+vi+sion)
18. Use physical action when learning a word

19. Written repetition
20. Keep a vocabulary notebook
21. Testing oneself with word tests
22. Use semantic maps
23. Use new word in sentences
24. Configuration
25. Paraphrase the word's meaning
26. Use semantic feature grids
27. Word lists
28. Use the vocabulary section in your textbook
29. Use spaces word practice
30. Teacher checks students' flash cards or word lists for accuracy
31. Group words together spatially on a page (e.g. arrange the words in a rectangular or Z-shaped pattern)
32. Group words together within a storyline
33. Part of speech (remembering)
34. Flash cards
35. Skip or pass new word (focus on more important vocabulary)
36. Say new word aloud when studying
37. Learn the words of an idiom together
38. Take notes in class
39. Listen to tape of word lists
40. Continue or study word over time
41. Image word form (combine the spelling of words with a specific image)

2.4 Vocabulary Learning Strategies (Chinese)

在**学习新单词**时，你对于以下词汇学习**策略**的使用程度

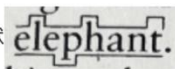
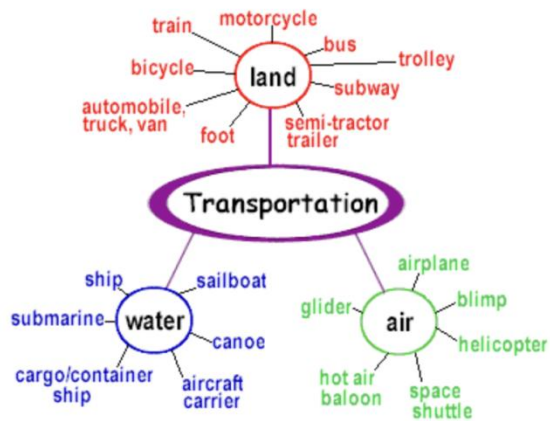
	完全不使用	偶尔使用	一般使用	经常使用	总是使用
1. 分析词性	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2. 分析词根和词缀 (比如: television中, tele远, vi看, sion表示名词)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3. 向老师询问中文翻译	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4. 向老师询问释义或同义词	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
5. 查询中文同源词 (比如: tank和坦克; bacon和培根)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
6. 向老师询问包含新单词的句子	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
7. 分析任何可参考的图片和手势	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
8. 根据语境猜测	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
9. 使用双语词典	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
10. 向同学寻求帮助	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
11. 使用单语词典	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
12. 查词汇表	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
13. 通过小组活动发掘新含义	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
14. 使用单词卡片	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

在**复习单词**时，你对于以下词汇学习**策略**的使用程度

	完全不使用	偶尔使用	一般使用	经常使用	总是使用
1. 在小组中学习与练习单词的含义	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2. 将单词与其同义词和反义词联系起来	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3. 将单词分组进行学习	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4. 学习单词的拼写	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
5. 通过关联与单词相关的场景、位置与画面记忆单词	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
6. 利用同源词进行学习 (比如: tank和坦克; bacon和培根)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
7. 反复读出来	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
8. 在物品上贴英文标签	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
9. 使用英语媒体 (歌曲, 电影, 新闻广播等)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
10. 与母语者互动	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
11. 使用图示来学习单词的意思	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
12. 将单词与个人经历联系起来	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
13. 将单词与同类单词联系起来 (比如: 将"apple"与"pear"等水果单词联想到一起)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
14. 使用"等级"来学习可分级形容词 (比如: huge/big/medium-sized/small/tiny)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

在复习单词时，你对于以下词汇学习策略的使用程度

	完全不 用	偶 尔 使 用	一 般 使 用	经 常 使 用	总 是 使 用
15. 学习单词的发音	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
16. 在单词首字母下划线	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
17. 记忆词缀和词根 (比如: television中, tele远, vi看, sion表示名词)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
18. 在学习单词时使用肢体动作	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
19. 反复写出来	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
20. 准备一个单词笔记本	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
21. 用单词测试自测	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
22. 使用语义地图	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
23. 使用新单词造句	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
24. 画出词汇的形状	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
25. 用不同的表述方式解释单词的含义	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>



在复习单词时，你对于以下词汇学习策略的使用程度

完 偶 一 经 总
全 尔 般 常 是
不 使 使 使 使
用 用 用 用 用

26. 使用语义特征网

	<i>Has hair</i>	<i>Vertebrate</i>	<i>Lives on land</i>	<i>Lives at sea (aquatic)</i>	<i>Able to fly</i>	<i>Herbivore (primary-consumer)</i>	<i>Carnivore (secondary-consumer)</i>	<i>Omnivore</i>	<i>Marsupial</i>	<i>Produces milk</i>
<i>Bear</i>	+	+	+	-	-	-	-	+	-	+
<i>Bat</i>	+	+	+	-	+	+	+	-	-	+
<i>Lion</i>	+	+	+	-	-	-	+	-	-	+
<i>Seal</i>	+	+	-	+	-	-	+	-	-	+
<i>Kangaroo</i>	+	+	+	-	-	+	-	-	+	+
<i>Whale</i>	+	+	-	+	-	-	+	-	-	+
<i>Ferret</i>	+	+	+	-	-	-	+	-	-	+

27. 列词汇表

28. 使用课本上的词汇章节

29. 按照一定时间规律复习单词 (比如: 刚学完5-10分钟后复习, 24小时后复习, 1周后复习等等)

30. 让老师检查学生的单词卡片或单词表是否准确

31. 将单词按照空间排列在一页纸上 (比如: 将单词排列成长方形或Z字形等)

32. 将单词放在故事情节中

33. 记忆词性

34. 使用单词卡片

35. 跳过或放弃一些新单词 (着眼于学习更重要的词汇)

36. 学习单词时大声说出来

37. 学习习语时, 将单词一并学习

38. 在课上记笔记

39. 听词汇列表的录音

40. 随时间推移持续学习单词

41. 形象化单词的形式 (将单词的拼写结合一个具体的图像来记忆)

2.5 Participant details (English)

1. Name _____
2. Age _____
3. Gender
 - A. Male
 - B. Female
 - C. Others
 - D. Prefer not to say
4. The region where you mainly live and work
 - A. Changchun City, Jilin Province
 - B. Other regions in Jilin Province
5. Highest degree or level of education
 - A. High school diploma or below
 - B. Bachelor's Degree
 - C. Master's Degree
 - D. PhD. or higher
6. Have you ever studied or lived in an English-speaking country?
 - A. No
 - B. Yes, less than or equal to 1 year
 - C. Yes, more than 1 year
7. Self-report language proficiency
 - A. Advanced
 - B. Upper-intermediate
 - C. Intermediate
 - D. Pre-intermediate
 - E. Elementary
8. Time exposed to English each week (e.g. read English news; attend English corner; watch English TV series) _____
9. Years spent learning English _____
10. E-mail address _____

2.6 Participant details (Chinese)

1. 姓名 _____
2. 年龄 _____
3. 性别
 - A. 男
 - B. 女
 - C. 其他
 - D. 保密
4. 您主要生活或工作的地区
 - F. 吉林省长春市
 - G. 吉林省其他地区
5. 最高学历或教育水平
 - A. 高中及以下
 - B. 学士学位
 - C. 硕士学位
 - D. 博士学位或更高
6. 你曾在英语国家学习或生活过吗?
 - A. 没有
 - B. 有, 但小于等于1年
 - C. 有, 并大于1年
7. 自评语言能力
 - A. 高级
 - B. 中高级
 - C. 中级
 - D. 准中级
 - E. 初级
8. 每周接触英语时间 (如: 阅读英语新闻、参加英语角、看英语电视节目等), 以小时计算

9. 学习英语的年限 _____
10. 电子邮件地址 _____

Appendix 3. Vocabulary Levels Test

The 2000 word level

1	copy	_____	end or highest	1	accident	_____	loud deep
2	event		point	2	debt		sound
3	motor	_____	this moves a	3	fortune	_____	something you
4	pity		car	4	pride		must pay
5	profit	_____	thing made to	5	roar	_____	having a high
6	tip		be like another	6	thread		opinion of yourself

1	coffee	_____	money for	1	arrange	_____	grow
2	disease		work	2	develop	_____	put in order
3	justice	_____	a piece of	3	lean	_____	like more than
4	skirt		clothing	4	owe		something
5	stage	_____	using the law	5	prefer		else
6	wage		in the right way	6	seize		

1	clerk	_____	a drink	1	blame	_____	make
2	frame	_____	office worker	2	elect	_____	choose by
3	noise	_____	unwanted	3	jump		voting
4	respect		sound	4	threaten	_____	become like
5	theater			5	melt		water
6	wine			6	manufacture		

1	dozen	_____	chance	1	ancient	_____	not easy
2	empire	_____	twelve	2	curious	_____	very old
3	gift	_____	money paid	3	difficult	_____	related to God
4	tax		to the	4	entire		
5	relief		government	5	holy		
6	opportunity			5	social		

1	admire	_____	make wider or	1	slight	_____	beautiful
2	complain		longer	2	bitter	_____	small
3	fix	_____	bring in for	3	lovely	_____	liked by many
4	hire		the first time	4	merry		people
5	introduce	_____	have a high	5	popular		
6	stretch		opinion of someone	6	independent		

The 3000 word level

- | | | | | | |
|---|----------------|---------------------|---|------------|-----------------------|
| 1 | bull | _____ formal and | 1 | muscle | _____ advice |
| 2 | champion | serious | 2 | counsel | _____ a place |
| 3 | dignity | manner | 3 | factor | covered with |
| 4 | hell | _____ winner of a | 4 | hen | grass |
| 5 | museum | sporting event | 5 | lawn | _____ female |
| 6 | solution | _____ building | 6 | atmosphere | chicken |
| | | where | 5 | lawn | |
| | | valuable | 6 | atmosphere | |
| | | objects are | | | |
| | | shown | | | |
| | | | | | |
| 1 | blanket | _____ holiday | 1 | abandon | _____ live in a place |
| 2 | contest | _____ good quality | 2 | dwell | _____ follow in |
| 3 | generation | _____ wool covering | 3 | oblige | order to catch |
| 4 | merit | used on | 4 | pursue | _____ leave |
| 5 | plot | beds | 5 | quote | something |
| 6 | vacation | | 6 | resolve | permanently |
| | | | | | |
| 1 | comment | _____ long formal | 1 | assemble | _____ look closely |
| 2 | gown | dress | 2 | attach | _____ stop doing |
| 3 | import | _____ goods from a | 3 | peer | something |
| 4 | nerve | foreign | 4 | quit | _____ cry out loudly |
| 5 | pasture | country | 5 | scream | in fear |
| 6 | tradition | _____ part of the | 6 | toss | |
| | | body which | | | |
| | | carries feeling | | | |
| | | | | | |
| 1 | pond | _____ group of | 1 | drift | _____ suffer |
| 2 | angel | animals | 2 | endure | patiently |
| 3 | frost | _____ spirit who | 3 | grasp | _____ join wool |
| 4 | herd | serves God | 4 | knit | threads |
| 5 | fort | _____ managing | 5 | register | together |
| 6 | administration | business and | 6 | tumble | _____ hold firmly |
| | | affairs | | | with your |
| | | | | | hands |
| | | | | | |
| 1 | brilliant | _____ thin | 1 | aware | _____ usual |
| 2 | distinct | _____ steady | 2 | blank | _____ best or most |
| 3 | magic | _____ without | 3 | desperate | important |
| 4 | naked | clothes | 4 | normal | _____ knowing what |
| 5 | slender | | 5 | striking | is happening |
| 6 | stable | | 6 | supreme | |

The 5000 word level

1 analysis	_____	eagerness	1 artillery	_____	a kind of tree
2 curb	_____	loan to buy a	2 creed		
3 gravel		house	3 hydrogen	_____	system of
4 mortgage	_____	small	4 maple		belief
5 scar		stones	5 pork	_____	large gun
6 zeal		mixed with	6 streak		on wheels
		sand			
1 cavalry	_____	small hill	1 chart	_____	map
2 eve	_____	day or night	2 forge	_____	large beautiful
3 ham		before a	3 mansion		house
4 mound		holiday	4 outfit	_____	place where
5 steak	_____	soldiers who	5 sample		metals are
6 switch		fight from	6 volunteer		made and
		horses			shaped
1 circus	_____	musical	1 revive	_____	think about
2 jungle		instrument	2 extract		deeply
3 trumpet	_____	seat without	3 gamble	_____	bring back to
4 sermon		a back or	4 launch		health
5 stool		arms	5 provoke	_____	make
6 nomination	_____	speech	6 contemplate		someone
		given by a			angry
		priest in a			
		church			
1 shatter	_____	have a rest	1 decent	_____	weak
2 embarrass	_____	break	2 frail	_____	concerning a
3 heave		suddenly into	3 harsh		city
4 obscure		small	4 incredible	_____	difficult to
5 demonstrate		pieces	5 municipal		believe
6 relax	_____	make	6 specific		
		someone feel			
		shy or			
		nervous			
1 correspond	_____	exchange	1 adequate	_____	enough
2 embroider		letters	2 internal	_____	fully grown
3 lurk	_____	hide and wait	3 mature	_____	alone away
4 penetrate		for someone	4 profound		from other
5 prescribe	_____	feel angry	5 solitary		things
6 resent		about	6 tragic		
		something			

The 10 000 word level

1	alabaster	_____	small barrel	1	throttle	_____	kindness
2	tentacle	_____	soft white	2	convoy	_____	set of musical
3	dogma		stone	3	lien		notes
4	keg	_____	tool for	4	octave	_____	speed control
5	rasp		shaping wood	5	stint		for an
6	chandelier			6	benevolence		engine

1	bourgeois	_____	middle class	1	scrawl	_____	write
2	brocade		people	2	cringe		carelessly
3	consonant	_____	row or level	3	immerse	_____	move back
4	prelude		of something	4	peek		because of
5	stupor	_____	cloth with a	5	contaminate		fear
6	tier		pattern or gold or silver threads	6	relay	_____	put something under water

1	alcove	_____	priest	1	blurt	_____	walk in a
2	impetus	_____	release from	2	dabble		proud way
3	maggot		prison early	3	dent	_____	kill by
4	parole	_____	medicine to	4	pacify		squeezing
5	salve		put on	5	strangle		someone's
6	vicar		wounds	6	swagger		throat
						_____	say suddenly without thinking

1	alkali	_____	light joking	1	illicit	_____	immense
2	banter		talk	2	lewd	_____	against the
3	coop	_____	a rank of	3	mammoth		law
4	mosaic		British	4	slick	_____	wanting
5	stealth		nobility	5	temporal		revenge
6	viscount	_____	picture made of small pieces of glass or stone	6	vindictive		

1	dissipate	_____	steal	1	indolent	_____	lazy
2	flaunt	_____	scatter or	2	nocturnal	_____	no longer
3	impede		vanish	3	obsolete		used
4	loot	_____	twist the	4	torrid	_____	clever and
5	squirm		body about	5	translucent		tricky
6	vie		uncomfortably	6	wily		

Appendix 4. Ethical Approval Confirmation Email

Research ethics approval

Research title: The role of motivation and strategies in L2 vocabulary knowledge: A structural equation modelling study

Research ethics reference: EDUC-C1A-23-114

Dear XXXX,

The above application has been considered on behalf of the Education Departmental Research Ethics Committee (DREC) in accordance with the University's procedures for ethical approval of all research involving human participants.

I am pleased to confirm that, on the basis of the information provided to the DREC, ethics approval has now been granted for this study.

Good luck with your research.

Yours sincerely

Emma

DREC member

Appendix 5. Participant Information Sheet

5.1 Participant Information Sheet (English)

The aim of this research is to examine the joint influence of different motivational factors and learning strategies on the vocabulary breadth of adult learners of English as a foreign language (EFL) in China.

You have been invited to participate as you (1) are 22 and over; (2) have graduated from university; (3) are native Chinese speakers; (3) mainly live and work in the Northeast region of China; (4) still learn or use English on a regular basis. Please read through this information before agreeing to participate (if you wish to) by ticking the 'yes' box below. You may ask any questions before deciding to take part by contacting the researcher (details below).

The Student Researcher is XXXX, who is attached to the Department of Education at the University of Oxford. This research is being completed under the supervision of Prof. XXXX.

Participants will be asked to finish three questionnaires, the first one surveying the participants motivation, the second their strategies for English vocabulary learning, and the third eliciting their demographic information, such as age, gender and English learning experience. A test will also be used to measure participants' vocabulary breadth. All questionnaire items will be presented to the participants in Chinese with some English examples if necessary. This should take about 35-55 minutes in total. No background knowledge is required. The data is needed because the questions in this study involve three variables, including motivation, vocabulary learning strategies and vocabulary breadth.

Do I have to take part?

No. Please note that participation is voluntary. If you do decide to take part, you may withdraw at any point for any reason before submitting your answers by pressing the 'Exit' button/ closing the browser. However, withdrawal will not be possible 48 hours after your submission.

How will my data be used?

We will not collect any data that could directly identify you.

Your IP address will not be stored and your personal data (i.e., participants' names and contact information) will not be retained and will be destroyed following conclusion of the study. We will take all reasonable measures to ensure that data remain confidential.

The responses you provide will be stored in a password-protected electronic file on University of Oxford secure servers and may be used in academic publications, and/or conference presentations. Research data will be stored for three years after publication or public release of the work of the research.

Who will have access to my data?

The University of Oxford is the data controller with respect to your personal data and, as such, will determine how your personal data is used in the research. The University will process your personal data for the purpose of the research outlined above. Research is a task that we perform in the public interest. Further information about your rights with respect to your personal data is available from <https://compliance.admin.ox.ac.uk/individual-rights>.

The data you provide may be shared with the student's supervisor (principal investigator) during the project.

The results will be written up for a Master's degree.

Who has reviewed this research?

This research has been reviewed by, and received ethics clearance through, a subcommittee of the University of Oxford Central University Research Ethics Committee <https://researchsupport.admin.ox.ac.uk/governance/ethics/committees/curec>

Who do I contact if I have a concern or I wish to complain?

If you have a concern about any aspect of this research, please speak to XXXX (XXXX@education.ox.ac.uk) or her supervisor Prof. XXXX (XXXX@education.ox.ac.uk), and we will do our best to answer your query. / We will acknowledge your concern within 10 working days and give you an indication of how it will be dealt with. If you remain unhappy or wish to make a formal complaint, please contact the Chair of the Research Ethics Committee at the University of Oxford who will seek to resolve the matter as soon as possible (Social Sciences & Humanities Interdivisional Research Ethics Committee; Email: ethics@socsci.ox.ac.uk; Address: Research Services, University of Oxford, Boundary Brook House, Churchill Drive, Headington, Oxford OX3 7GB)

5.2 Participant Information Sheet (Chinese)

本研究旨在研究不同动机因素和学习策略对中国成年英语学习者词汇广度的共同影响。您因符合以下条件而被邀请参加：（1）年龄在 22 岁及以上；（2）已经大学毕业；（3）以中文为母语；（3）主要生活和工作在中国吉林省地区；（4）仍经常学习或使用英语。请在同意参与之前（如果您希望参与），阅读本信息并在下面的“是”框中打勾。您可以在决定参加之前通过联系研究人员（详细信息如下）来提出任何问题。

学生研究员是 XXXX，隶属于牛津大学教育系。此研究在 XXXX 教授的监督下完成。参与者将被要求完成三份问卷调查，第一份调查参与者的英语学习动机，第二份调查参与者的英语词汇学习策略，第三份调查参与者的背景信息，例如年龄、性别和英语学习经验。该研究还将使用一项测试来测量参与者的词汇广度。问卷将主要以中文呈现，额外附有一些英语示例。整个过程应该需要 35-55 分钟，不需要任何背景知识。这些数据是必需的，因为本研究的问题涉及三个变量，包括动机、词汇学习策略和词汇广度。

【我必须参加吗？】

不是的。请注意，参与是自愿的。如果您决定参加，您可以在提交答案之前的任何时候出于任何原因退出，方法是按下“退出”按钮/关闭浏览器。然而，提交 48 小时后将无法退出。

【我的数据将如何被使用？】

我们不会收集任何能够直接识别您身份的数据。您的 IP 地址将不会被存储，您的个人数据（即参与者的姓名和联系信息）将不会被保留，并将在研究结束后销毁。我们将采取一切合理措施确保数据保密。您提供的回答将存储在牛津大学安全服务器上有密码保护的电子文件中，并可能在学术出版物和/或会议演示中使用。研究数据将在出版或公开发布研究成果三年后存储。

【谁将能够访问我的数据？】

牛津大学是您个人数据的数据控制者，因此将确定您的个人数据在研究中的使用方式。大学将处理您的个人数据以完成上述研究任务。研究是我们进行公共利益的任务。有关您个人数据权利的更多信息可在 <https://compliance.admin.ox.ac.uk/individual-rights> 上获得。您提供的数据可能会在项目期间与学生的导师（主要研究者）共享，最终将被撰写为硕士学位论文。

【谁审查这项研究？】

这项研究已经由牛津大学中央大学研究伦理委员会的一个小组审查并获得了伦理审批。
<https://researchsupport.admin.ox.ac.uk/governance/ethics/committees/curec>

【如果我有疑问或想投诉，我应该联系谁？】

如果您有任何疑问或投诉，请联系 XXXX (XXXX@education.ox.ac.uk) 或她的导师 XXXX 教授 (XXXX@education.ox.ac.uk)，我们将尽力回答您的疑问。我们将在 10 个工作日内确认收到您的邮件，并告知您如何处理。如果您仍然不满意或希望进行正式投诉，请联系牛津大学研究伦理委员会主席，他将尽快解决问题（社会科学和人文学科跨学部研究伦理委员会；电子邮件：ethics@socsci.ox.ac.uk；地址：牛津大学研究服务部，Boundary Brook House, Churchill Drive, Headington, 牛津 OX3 7GB）。

Appendix 6. Participant Consent Form

6.1 Participant Consent Form (English)

Please note that you may only participate in this survey if you are 18 years of age or over.

I certify that I am 18 years of age or over

If you have read the information above and agree to participate with the understanding that the data (including any personal data) you submit will be processed accordingly, please tick the box below to start.

Yes, I agree to take part

6.2 Participant Consent Form (Chinese)

请注意，只有年满18岁或以上的人才可以参与此调查。

我确认我已年满18岁

如果您已经阅读了上面的信息，并同意参与，并理解您提交的数据（包括任何个人数据）将会被相应处理，请在下面打勾以开始。

是的，我同意参与

Appendix 7. Examples of Individual Scores

7.1 Sub-scales of Intrinsic and Extrinsic Motivation

EXTER1	EXTER2	EXTER3	INTRO4	INTRO5	INTRO6	IDEN7	IDEN8	IDEN9	Extrinsic Motivation	KNOW10	KNOW11	KNOW12	ACCOM13	ACCOM14	ACCOM15	STIMU16	STIMU17	STIMU18	Intrinsic Motivation
1	2	2	3	4	1	3	4	4	2.66666667	2	2	4	3	1	2	2	3	2	2.33333333
1	2	3	1	3	2	3	1	1	1.88888889	1	3	1	1	1	3	1	4	1	1.77777778
3	2	2	4	5	3	3	2	4	3.11111111	1	1	1	3	1	1	1	2	1	1.33333333
1	2	1	4	4	2	5	2	4	2.77777778	4	5	5	5	4	5	3	5	3	4.33333333
1	2	2	5	1	1	3	2	5	2.44444444	2	5	4	5	5	5	4	4	2	4
3	2	2	4	3	2	2	2	4	2.66666667	2	2	2	4	3	3	3	2	3	2.66666667
1	2	3	3	1	1	4	3	3	2.33333333	2	4	4	4	3	1	2	3	2	2.77777778
3	2	4	2	3	3	2	3	3	2.77777778	2	3	3	3	4	3	2	3	4	3
2	2	2	2	2	2	2	2	2	2	1	2	2	2	2	2	2	1	2	1.77777778
5	2	4	3	5	3	2	1	3	3.11111111	4	2	3	4	4	3	3	1	4	3.11111111
3	2	2	2	3	3	2	3	3	2.55555556	4	2	2	3	4	3	4	1	3	2.88888889
2	2	2	5	5	4	5	5	5	3.88888889	3	4	3	5	2	1	4	1	4	3
2	2	4	4	3	4	3	4	4	3.33333333	4	4	4	4	4	4	4	4	4	4
2	2	3	4	3	4	2	3	3	2.88888889	4	4	2	2	2	2	3	4	3	2.88888889
2	2	3	3	3	4	2	2	3	2.66666667	3	4	2	4	3	2	2	3	2	2.77777778
3	2	4	4	2	2	5	3	3	3.11111111	1	4	5	2	5	1	1	3	5	3
1	1	1	1	1	1	1	1	1	1	2	2	2	1	2	1	1	1	1	1.44444444
1	1	1	1	1	1	3	1	5	1.66666667	5	5	5	5	5	1	3	5	5	4.33333333
1	1	2	2	2	1	1	4	1	1.66666667	1	2	1	1	1	1	1	1	1	1.11111111
1	1	5	5	5	2	3	5	5	3.55555556	5	5	5	5	5	5	5	5	5	5
2	1	2	3	2	2	2	4	2	2.22222222	2	2	2	3	2	2	3	1	2	2.11111111
2	1	3	4	2	2	2	3	3	2.44444444	2	2	3	2	3	2	2	1	2	2.11111111
1	3	3	5	1	1	4	5	5	3.11111111	5	5	5	5	3	3	3	5	2	4
1	3	2	4	4	1	5	5	5	3.33333333	3	4	3	3	4	2	2	3	4	3.11111111
1	3	3	5	3	1	4	3	4	3	2	4	4	5	4	4	3	5	4	3.88888889
1	3	2	4	4	1	4	2	3	2.66666667	2	3	2	3	2	2	2	4	2	2.44444444
5	3	5	1	2	1	1	5	3	2.88888889	1	2	1	1	1	2	1	2	1	1.33333333
1	3	2	3	1	1	4	1	3	2.11111111	3	3	2	2	2	2	1	3	2	2.22222222
3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
1	3	3	3	3	1	4	3	4	2.77777778	4	3	4	3	3	3	3	3	4	3.33333333
1	3	4	1	1	1	2	4	1	2	1	1	1	1	1	1	1	1	1	1
4	3	4	4	4	4	4	4	4	3.88888889	4	4	3	4	4	4	4	3	3	3.66666667
3	3	3	4	2	2	4	3	3	3	4	3	4	4	2	2	3	3	2	3
1	3	2	3	1	1	1	5	5	2.44444444	3	4	5	2	1	3	1	3	1	2.55555556
3	3	3	3	3	3	3	2	3	2.88888889	3	3	3	3	3	3	3	3	3	3
4	3	4	4	4	4	4	4	3	3.77777778	4	4	3	4	4	4	4	4	3	3.77777778
3	3	4	3	4	4	4	4	3	3.55555556	4	3	4	4	4	4	4	3	4	3.77777778
3	3	4	4	4	3	4	4	4	3.66666667	4	3	4	4	4	4	3	3	4	3.66666667

7.2 Sub-scales of Vocabulary Learning Strategies

DET1	DET2	DET3	DET4	DET5	DET6	DET7	DET8	DET9	DET	SOC10	SOC11	SOC12	SOC13	SOC14	SOC15	SOC16	SOC17	SOC	MEM18	MEM20	MEM21	MEM22	MEM23	MEM24	MEM27	MEM28	MEM29	MEM30	MEM31	MEM32		
2	4	4	3	3	2	4	2	1	2.77777778	2	2	2	1	2	1	1	2	1.5	4	4	2	2	1	2	2	1	3	2	2	3		
1	2	4	2	3	3	3	4	2	2.66666667	3	3	3	3	4	3	3	3	3.125	4	4	3	5	3	3	5	4	4	5	2	3		
5	1	1	1	5	5	5	1	1	2.77777778	5	5	5	2	1	1	1	5	3.125	1	1	1	2	1	1	1	1	5	5	1	5		
3	4	1	1	4	2	3	3	2	2.55555556	1	3	3	2	2	2	2	3	2.25	1	3	4	4	2	2	2	2	2	2	4	5		
4	4	5	3	4	4	4	2	1	3.44444444	2	2	2	2	3	2	3	4	2.5	2	2	3	4	1	3	4	1	4	4	3	4		
2	3	3	3	4	4	3	3	4	3.22222222	3	4	2	4	4	2	3	4	3.25	4	4	3	3	1	3	3	3	3	4	3	2		
5	2	1	3	5	1	2	5	3	3	5	4	4	3	3	1	2	3	3.125	2	4	4	3	2	4	3	1	2	2	4	5		
2	3	4	4	2	2	4	3	2	2.88888889	3	3	4	3	2	3	3	4	3.125	3	3	2	2	2	2	2	4	3	4	4	3	4	
2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	
1	3	2	3	3	3	2	4	5	2.44444444	5	5	2	1	2	2	4	2	2.875	2	3	2	2	2	2	1	2	3	3	2	3		
3	2	3	3	3	3	2	4	5	2.88888889	4	3	2	2	3	4	2	2	2.75	4	4	2	2	3	1	1	2	4	1	1	5		
3	4	3	3	4	5	3	2	1	3.11111111	1	1	1	3	1	1	1	4	1.625	5	3	3	2	1	3	2	1	1	2	4	4		
3	4	4	4	4	3	3	3	4	3.55555556	3	4	4	3	4	2	4	4	3.5	4	4	2	4	2	4	3	4	4	4	4	4	3	
3	4	3	4	2	3	3	4	3	3.22222222	3	2	2	3	2	4	4	3	2.875	4	2	3	3	4	3	2	2	3	3	3	3	3	
3	2	2	3	4	3	3	3	4	3	4	3	3	4	3	2	3	3	3.125	2	3	3	3	2	4	3	4	4	4	4	4	2	
2	4	2	3	2	5	4	3	2	3	1	1	4	5	3	2	1	4	2.625	1	5	4	3	1	2	5	5	3	2	2	2	2	
2	1	1	2	2	4	2	4	2	2.22222222	1	1	1	1	1	1	1	2	1.125	4	2	1	2	1	2	4	1	2	2	4	4	4	
3	4	3	5	5	1	4	5	3	3.66666667	1	1	5	1	5	3	1	2	2.375	3	3	4	4	3	3	5	1	5	2	4	5		
3	4	2	3	3	4	1	4	2	2.88888889	4	4	5	3	1	1	5	2	3.125	3	2	5	5	5	2	5	4	3	2	5	5	5	
3	5	4	5	5	5	5	5	1	4.22222222	3	1	1	3	3	5	5	1	2.75	5	5	5	5	1	3	5	1	5	5	5	5	5	
3	2	3	2	3	3	3	3	4	2.88888889	3	3	2	3	4	4	2	3	3	3	4	4	3	2	4	2	3	2	2	2	3	3	
2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1	3	1	1.875	1	1	3	1	3	3	1	1	3	1	1	1	3	
1	2	3	3	3	3	5	5	2	3.33333333	2	2	2	3	3	3	1	3	2.375	4	3	4	3	2	4	3	3	2	2	3	4	4	
4	3	3	3	4	4	5	4	1	3.44444444	2	2	2	2	2	1	1	2	1.75	1	2	2	3	1	4	3	3	2	2	4	4	4	
2	2	1	4	4	3	3	5	2	2.88888889	3	3	3	2	3	2	2	1	2.5	3	4	4	3	1	2	3	2	1	4	4	5		
4	4	2	3	4	4	2	4	2	3.22222222	2	2	2	3	2	3	2	3	4	2.5	2	3	2	2	1	3	4	1	4	2	4	5	
2	2	2	4	2	3	4	3	3	2.77777778	5	3	5	4	3	3	3	3	3.625	2	2	3	3	1	3	4	1	4	3	2	3	3	
2	2	3	4	3	4	4	4	3	3.22222222	3	3	3	4	3	3	3	3	3.125	3	2	3	1	2	3	3	3	2	3	5	4	4	
2	3	2	2	2	2	3	3	2	2.33333333	2	2	2	2	3	3	2	3	2.375	3	3	3	3	2	3	3	2	2	3	3	3	3	
5	5	3	2	5	5	2	2	2	3.44444444	2	2	2	2	2	2	2	5	2.375	1	1	2	2	2	2	2	1	3	4	4	4	5	
3	3	1	1	2	4	4	4	2	1.23333333	1	1	1	2	1	1	1	2	1.25	2	1	1	2	1	1	2	1	2	2	5	5	5	
2	4	4	4	4	4	4	4	4	3.77777778	4	4	4	4	3	2	4	4	3.625	3	3	4	2	4	4	4	4	4	4	4	4	4	4
3	3	3	3	3	3	3	3	4	3.11111111	4	2	4	2	3	4	2	3	3	3	4	5	2	4	2	3	3	3	4	3	3	4	
5	5	1	4	5	3	3	4	4	1.35555556	1	2	2	1	1	1	1	3	1.5	3	1	4	4	5	1	3	1	2	4	4	4	5	
2	3	4	4	2	2	2	2	2	2.55555556	3	3	2	3	3	2	1	3	2.5	2	3	3	3	3	2	4	3	3	3	1	2	2	
4	4	4	4	3	3	4	4	4	3.77777778	4	4	4	4	4	4	2	3	4	3.625	4	4	4	4	3	4	4	4	4	4	3	3	3
3	4	3	4	4	4	4	4	4	3.77777778	4	4	4	3	4	2	4	4	3.625	4	4	4	4	2	4	4	4	4	4	4	3	3	3
2	3	4	4	2	4	3	4	4	3.33333333	3	3	4	3	4	2	3	4	3.25	3	3	4	3	2	4	4	3	4	4	4	4	4	3

DET1	DET2	DET3	DET4	DET5	DET6	DET7	DET8	DET9	DET	SOC10	SOC11	SOC12	SOC13	SOC14	SOC15	SOC16	SOC17	SOC	MEM18	MEM20	MEM21	MEM22	MEM23	MEM24	MEM27	MEM28	MEM29	MEM30	MEM31	MEM32	
2	4	4	3	3	2	4	2	1	2.77777778	2	2	2	1	2	1	1	2	1.5	4	4	2	2	1	2	2	1	3	2	2	3	
1	2	4	2	3	3	3	4	2	2.66666667	3	3	3	3	4	3	3	3	3.125	4	4	3	5	3	3	5	4	4	5	2	3	
5	1	1	1	5	5	5	1	1	2.77777778	5	5	5	2	1	1	1	5	3.125	1	1	1	2	1	1	1	1	5	5	1	5	
3	4	1	1	4	2	3	3	2	2.55555556	1	3	3	2	2	2	2	3	2.25	1	3	4	4	2	2	2	2	2	2	4	5	
4	4	5	3	4	4	4	2	1	3.44444444	2	2	2	2	3	2	3	4	2.5	2	2	3	4	1	3	4	1	4	4	3	4	
2	3	3	3	4	4	3	3	4	3.22222222	3	4	2	4	4	2	3	4	3.25	4	4	3	3	1	3	3	3	3	4	3	2	
5	2	1	3	5	1	2	5	3	3	5	4	4	3	3	1	2	3	3.125	2	4	4	3	2	4	3	1	2	2	4	5	
2	3	4	4	2	2	4	3	2	2.88888889	3	3	4	3	2	3	3	4	3.125	3	3	2	2	2	2	2	4	3	4	4	3	4
2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
1	3	2	3	3	3	3	2	4	2.44444444	5	5	2	1	2	2	4	2	2.875	2	3	2	2	2	2	1	2	3	3	2	3	
3	2	3	3	3	2	4	5	1	2.88888889	4	3	2	2	2	3	4	2	2.75	4	4	2	2	3	1	1	2	4	1	1	5	
3	4	3	3	4	4	5	3	2	3.11111111	1	1	1	3	1	1	1	4	1.625	5	3	3	2	1	3	2	1	1	2	4	4	
3	4	4	4	4	3	3	3	4	3.55555556	3	4	4	3	4	2	4	4	3.5	4	4	2	4	2	4	3	4	4	4	4	4	3
3	4	3	4	2	3	3	4	3	3.22222222	3	2	2	3	2	4	4	3	2.875	4	2	3	3	4	3	2	2	3	3	3	3	3
3	2	2	3	4	3	3	3	4	3	4	3	3	4	3	2	3	3	3.125	2	3	3	3	2	4	3	4	4	4	4	4	2
2	4	2	3	2	5	4	3	2	3	1	1	4	5	3	2	1	4	2.625	1	5	4	3	1	2	5	5	3	2	2	2	2
2	1	1	2	2	4	2	4	2	2.22222222	1	1	1	1	1	1	1	2	1.125	4	2	1	2	1	2	4	1	2	2	4	4	4
3	4	3	5	5	1	4	5	3	3.66666667	1	1	5	1	5	3	1	2	2.375	3	3	4	4	3	3	5	1	5	2	4	5	
3	4	2	3	3	4	1	4	2	2.88888889	4	4	5	3	1	1	5	2	3.125	3	2	5	5	5	2	5	4	3	2	5	5	
3	5	4	5																												