DOCTOR OF PHILOSOPHY

The Effectiveness of an English Intervention Program for Mandarin-English Bilingual University Students

Liang, Chunyang

Award date:
2022

Awarding institution:
Coventry University

The Effectiveness of an English Intervention Program for Mandarin-English Bilingual University Students

BY

CHUNYANG LIANG

PHD

COVENTRY UNIVERSITY

JUNE 2021

The Effectiveness of an English Intervention Program for Mandarin-English Bilingual University Students

CHUNYANG LIANG

A thesis submitted in partial fulfilment of the requirements for the degree of Doctor of Philosophy

JUNE 2021

Certificate of Ethical Approval

Applicant:

Chunyang Liang

Project Title:

Predictors of English Reading and Spelling for Mandarin-English Bilingual Students in Higher Education

This is to certify that the above named applicant has completed the Coventry University Ethical Approval process and their project has been confirmed and approved as Medium Risk

Date of approval:

20 February 2017

Project Reference Number:

P46391

Certificate of Ethical Approval

Applicant:

Chunyang Liang

Project Title:

The Effectiveness of an English Intervention Program for Mandarin-English Bilingual University Students.

This is to certify that the above named applicant has completed the Coventry University Ethical Approval process and their project has been confirmed and approved as Medium Risk

Date of approval:

13 November 2018

Project Reference Number:

P67607

ABSTRACT

Previous studies demonstrated intervention programs focused on basic cognitive-linguistic skills (e.g., phonological and orthographic skills) could significantly improve English reading and spelling abilities of individuals in preschool to young adulthood across various alphabetic languages. Little attention has been paid to whether similar results will be observed in reading and spelling abilities of skilled readers. The current study aims to identify differences and similarities in reading and spelling processes in bilingual Mandarin- and English-speaking and monolingual English-speaking participants. The monolingual participants are expected to rely on phonological skills when reading and spelling. The bilingual participants are expected to rely more on whole word recognition skills when reading and spelling in English due to the characteristics of the Chinese writing system. Surprisingly, we found that English phonological awareness and orthographic knowledge contributed to accurate English reading and spelling. However, for English monolinguals, as they are skilled readers, phonological awareness can only predict their pseudoword-related tasks.

In study 2, Little attention has been devoted to examining the effects of English intervention programs on the English spelling abilities of Mandarin-English young adults. We investigated whether these interventions are also efficacious for Mandarin-English speakers, which could potentially contribute to the development of more effective instructional strategies for substantial numbers of EAL learners in the UK. We conducted two interventions over 6 weeks. Participants were assessed on English reading, English spelling, phonological and orthographic abilities (in both English and Mandarin) before and after the intervention.

Participants from both intervention programs made significant improvements in all measures except for Mandarin orthographic knowledge and visual memory measure after the intervention. The results showed that participants in the phonological intervention

group made more gains in phonological awareness (for English and Mandarin) and pseudoword reading and spelling but not in real word reading and spelling tasks. For the orthographic intervention, participants were found to produce more gains in real word reading and spelling abilities. These findings could provide theoretical foundations for a more comprehensive model of second language acquisition, as well as educational implications for competent teaching and instruction in adults from different language backgrounds.

ACKNOWLEDGMENTS

.

First I would like to express my sincere gratitude towards my supervisory team, Dr Georgia Niolaki, Dr Janet Vousden, Prof. Julia Carroll, Dr Laura Taylor through their guidance and expertise I was able to carry out this research independently to a greater depth.

I would also like to thank all those who volunteered to participate in my experiment and intervention programmes, I view all the input from every one of my participants has been a significant contribution to my success.

Last but not least, I want to thank my parents and my partner for their support whether physically, mentally or financially, as well as the positive energy and courage they have brought to me along the way.

Table of Contents

Chapter 1: Introduction *1*

1.1 Background and Context **1**

1.2 Research Contribution **3**

1.3 Research Objectives and Approach **3**

CHAPTER 2: Study 1 ..... *4*

2.1 Introduction **4**

2.1.1 Theories of reading and spelling of English 5

2.1.2 Theories of English literacy acquisition process 7

2.1.3 The characteristics of Chinese 9

2.1.4 Theories of reading and spelling of Chinese 16

2.1.5 Acquisition of English Reading and Spelling Skills 17

2.1.6 Word Reading and Spelling in English Monolinguals 18

2.1.7 Word reading and spelling in cross-linguistic contexts 20

2.2 Purpose of Study 1 ..... **27**

2.3 Methodology **28**

2.3.1 Participants 29

2.3.2 Materials 30

2.3.3 Procedure 42

2.4 Results **43**

2.5 Discussion **62**

CHAPTER 3: Study 2 ..... *79*

3.1 Introduction **79**

3.1.1 English education in China 83

3.1.2 The development of English spelling ability 91

3.1.3 The acquisition of English spelling skills 96

3.1.4 The Importance of vocabulary learning 98

3.1.5 The methods of English vocabulary learning 101
3.1.6 The effects of orthographic and phonological training on English word spelling for English monolinguals 105
3.1.7 The effects of orthographic and phonological training on English word spelling for ELLs 108
3.1.8 The effects of orthographic and phonological training on English word spelling for Chinese ELLs 113
3.1.9 The current study 117
3.2 Purpose of Study 2 119
3.3 Development of the intervention programme 122
3.3.1 Theoretical framework 123
3.3.2 Selection of target vocabulary 125
3.3.3 Design of intervention programme 127
3.4 Participants 134
3.5 Materials 134
3.6 Procedure 137
3.7 Results 138
3.8 Discussion 155
Chapter 4: General Discussion and Conclusion 163
4.1 Introduction 163
4.1.1 Cognitive linguistic factors that predict English monolinguals and Mandarin-L1 ELL literacy skills 164
4.1.2 Effectiveness of phonological awareness and orthographic inteventions 165
The Mandarin-L1 ELLs in the Study 1 performed significantly poorer on English phonological awareness task but it is still the strongest factor that contribute to their English reading and spelling abilities. Therefore, we designed a phonological awareness intervention to examine whether an explicit phonological training could improve Mandarin-L1 ELL's spelling ability. 165
4.1.3 Educational implications 166
4.2 Counclusion 167
List of References 168

List of Figures

Figure 1.1. The top ten non-European Union countries of domicile in 2017/18 for HE student enrolments (Academic years 2013/14 and 2017/18; source from HESA 2018). 1

Figure 2.1. the Dual-route Cascaded model of reading (adapted from Coltheart et al. 2001). 5

Figure 2.2. The theorical model of the spelling to dictation (adapted from Tainturier 2019). 7

Figure 2.3. The homophones of qing in Chinese. 11

Figure 3.1. The mean overall and individual band scores achieved by 2018 Academic and General Training test takers from the top 40 first language backgrounds (source from HESA, 2018)..... 83

Figure 3.2. The Action Research Model (adapted from Kemmis & Grundy, 1997). 124

Figure 3.3. Examples of pictures with embedded words (adjacent and consent) used for the visual imagery technique. 133

List of Figures

Table 2.1. Summary statistics for English monolingual and mandarin-English bilingual groups on all assessments (*standard deviations in parentheses*). 44

Table 2.2. Factor loadings for literacy skills in the factor analysis. 47

Table 2.3. Factor loadings for cognitive skills in the factor analysis. 48

Table 2.4. Correlations of English word reading and spelling and cognitive-linguistic measures for the monolingual group after controlling for age and non-verbal IQ. 49

Table 2.5. Correlations of English word reading and spelling and cognitive-linguistic measures in both English and Mandarin for the bilingual group after controlling for age and non-verbal IQ. 51

Table 2.6. Hierarchical regression analyses predicting real word and pseudoword reading from cognitive-linguistic skills for monolingual group. 54

Table 2.7. Hierarchical regression analyses predicting real word and pseudoword reading from cognitive-linguistic skills for bilingual group. 55

Table 2.8. Hierarchical regression analyses predicting real word and pseudoword spelling from cognitive-linguistic skills for monolingual group. 57

Table 2.9. Hierarchical regression analyses predicting real word and pseudoword spelling from cognitive-linguistic skills for bilingual group. 58

Table 2.10. Hierarchical regression analyses predicting English reading comprehension for the monolingual and bilingual groups 59

Table 2.11. Hierarchical regression analyses predicting English real word measures from Mandarin cognitive-linguistic skills for bilingual group. 60

Table 2.12. Hierarchical regression analyses predicting English pseudoword measures from Mandarin cognitive-linguistic skills for bilingual group. 61

Table 3.1. Comparison between experimental and control groups on demographic information 139

Table 3.2. Descriptive results from all measures by groups. 140

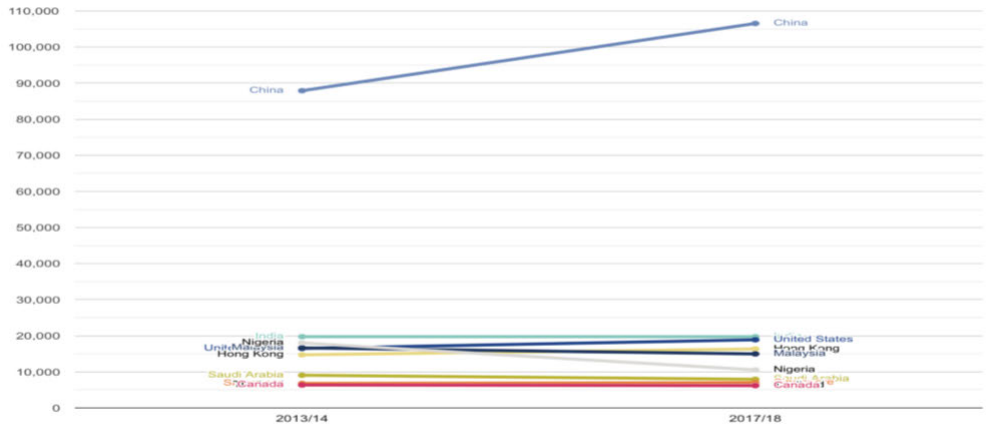
Table 3.3. Efficacy of the inteventions. 143

Chapter 1: Introduction

1.1 Background and Context

According to the statistics, in the academic years 2017/18, 13% (approximately 442,375) of students enrolled in Higher Education (HE) in the UK are from non-European Union countries (HESA, 2018). Within the international group, the number of Chinese students is the largest international student cohort, which exceeds other nationalities (UKCISA, 2021). In addition, this is the only student group demonstrating a significant growth, which is 14% increase over the last few years in student numbers (see Figure 1.1; HESA, 2018).

Figure 1.1. The top ten non-European Union countries of domicile in 2017/18 for HE student enrolments (Academic years 2013/14 and 2017/18; source from HESA 2018).



As one of the fastest-growing international student cohorts, Chinese students need to cope with the language requirements of their courses by providing evidence of sufficient

academic English language skills (e.g., the result of International English Language Testing System and Test of English as a Foreign Language). The converging evidence in the literature suggests that English language competency is essential for international students' academic performance at both undergraduate and postgraduate levels (Zhao, 1993; Phakiti, 2008; Oliver et al., 2012). Empirical evidence further indicates that the limited English competency of Chinese students has become one of the obstacles to their success studying abroad (Oliver et al., 2012; Ardasheva et al., 2012). Specifically, for their academic life, they need to deal with problems such as insufficient academic writing skills, difficulties in understanding lecturers and peers (Berman & Cheng 2001). If they could not solve these problems that are brought by limited English level, it will dramatically lead to lower self-esteem (Dev & Qiqieh, 2016) and self-confidence (Yihong et al., 2005). As for Chinese students who receive higher education in the UK, Trenkic and Warmington (2019) point out that 51% of the variance of their academic performance was explained by English literacy and language proficiency and this was not the case for their British peers. Therefore, it is necessary for both researchers and practitioners to investigate the factors that influence international students' English proficiency level and there is a bigger implication of the adults' language proficiency to provide appropriate supports for them.

Phonological awareness has been identified as a critical factor for the reading and spelling acquisition processes, especially for reading and spelling unfamiliar words. There is persuasive evidence that phonological awareness, which is the awareness to manipulate the individual speech sounds in the words, is one of the strongest predictors of learning to read and write in English language system (Wagner et al., 1997; Leong et al., 2005). However, for English language learners from non-alphabetic language backgrounds, especially for adults, the factors that can affect their English acquisiton process is still unclear. Therefore, the current study was first designed to fill in this research gap.

1.2 Research Contribution

- To contribute to the English acquisition model and second language acquisition model by assessing Mandarin-L1 ELL adults their patterns of English acquisition process, from theoretical perspective.

- To provide guidance and considerations on the design of supplement intervention and English curriculum aimed to help ELLs efficiently acquire English, from practical perspective.

1.3 Research Objectives and Approach

The aim of current study is twofold. Firstly it aims to investigate differences in reading and spelling processes in Chinese- and English-speaking adults and monolingual English adults. Specifically, the study will investigate whether bilingual Chinese- and English-speaking participants rely more on whole word recognition skills when learning English due to the characteristics of the Chinese writing system (evidence of transfer effect from L1 to L2) or phonological awareness due to the characteristics of the English. The second part of the study will aim to explore the effectiveness of two different interventions (phonological and orthographic) conducted with Mandarin-L1 ELL adults in learning to read and spell in English.

CHAPTER 2: Study 1

2.1 Introduction

The processes of language acquisition, especially that of alphabetic languages acquisition, has attracted intensive attention of both researchers and educators over the past decades. Researchers have put burgeoned efforts in psychology, education, and cognitive science areas to gain a deeper understanding of the literacy acquisition processes. This is the case as literacy skills (e.g., ability to read and write) are necessary for the successful development of reading comprehension, which will further affect reading achievement and academic performance for both children and adults (Graham, 1987; Oakhill et al., 2003; Perfetti et al., 2005; Moats, 2009). Learning to read and spell is a complex process and involves various cognitive-linguistic skills. To become a skilled reader, the learners must be able to read accurately, automatically and also comprehend the text (Pikulski & Chard, 2005; Adlof et al., 2011; Magpuri-Lavell et al., 2014). If any of these skills are malfunctioning, it will potentially cause reading and/or spelling difficulties (Li, 2018). Empirical evidence indicated that the fluent and accurate decoding abilities in English reading and spelling are the essential components of skilled reading and spelling activities (Stanovich & Seigel, 1994; Adam et al., 1998). Moreover, learning to read and spell in different languages will involve multidimensional cognitive skills due to the different characteristics of each acquired language. When readers learn another language as a second or additional language, they will bring the cognitive-linguistic skills that are efficient for them to learn their first language (hereafter L1) to facilitate their second language (hereafter L2) learning, which is known as the transfer effect (August et al., 2009). In the current study, the skills that will influence successful L2 literacy development will be investigated.

2.1.1 Theories of reading and spelling of English

Coltheart et al. (2001) proposed the Dual-route Cascaded model to explain the process of skilled reading (see Figure 2.1). They indicated that successful reading could be achieved by two internal routes: the lexical route and the sub-lexical route. Two of the crucial premises in the representational/symbolic model are that, first of all, it assumes a mental lexicon where each word processes a localist representational entry of itself, and that a mental storage unit for grapheme-phoneme correspondence rules is hypothesised. A "lexical route" and a "non-lexical route" are distinguished in order to accommodate empirical findings as to word familiarity and spelling regularity. The former is to recognise acquainted words in print as a whole unit by sight, while the latter is called upon to process unknown words or pseudowords via grapheme-phoneme correspondence rules. What's more, exception words can be read accurately only via the lexical route, and pseudowords only via the non-lexical route.

Figure 2.1. the Dual-route Cascaded model of reading (adapted from Coltheart et al. 2001).

Recently, Coltheart et al. (2001) have successfully offered the dual route cascaded (DRC) model, a computationally implemented version of the dual route model. The DRC model is consistent with the overlapping wave model (Siegler, 1996), positing that the lexical and non-lexical paths are both activated simultaneously to identify a given word, and that, eventually, the lexical route will win over the non-lexical route after repeated exposures to this word for the sake of economy and efficiency. A feedback mechanism is also integrated into the system to more swiftly and accurately aid recognition of common, recurrent symbol-sound patterns. In spite of its robust explanatory power to account for the bulk of the behavioral data on a range of lexical effects, the dual route model is not a proper model for reading development, in that it fails to provide an answer to the critical issue concerning the occurrences of transition from a given word being sounded out via the indirect/non-lexical route during initial exposure to finally being identified fluently by sight via the direct/lexical route.

As for the spelling process involved in spelling to dictation, similar to the reading model mentioned above, two main procedures are involved: the lexical process and the sublexical process (see Figure 2.2). That is, if the individual meets familiar words, the lexical process will be activated to enable the individual to retrieve the words and the spelling from long-term memory (orthographic lexicon). Compared to the sublexical process, the lexical process is more automatic and effortless for skilled spellers to spell irregular words (e.g., <eight>) and the words that are acquired before. The accuracy of accessing this route is assumed to be the frequency of the words and the age of acquisition (Tainturier, 2019).

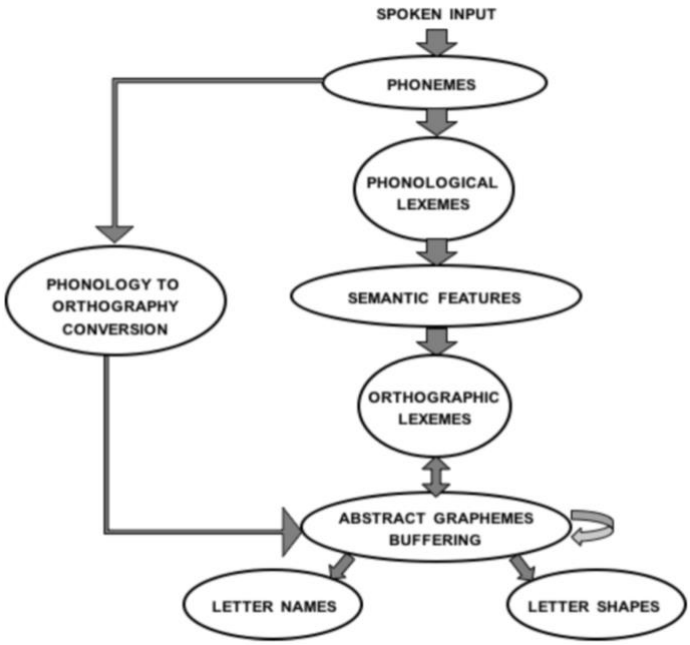
In contrast, the sublexical process will be activated by phonological input. Once the spoken units are processed, these phonological sequences will be converted to orthographic units, normally letters. However, English is an inconsistent language that one sound could accord to several spellings (e.g., the /ɪ/ in *tree* and in *read*). When the individual encounters this

situation, the phonology to orthography conversion route is prone to select the most frequent spelling form (Tainturier, 2019).

2.1.2 Theories of English literacy acquisition process

Following, the process of how children learn to read and spell alphabetic writing systems will be briefly reviewed with a focus on English.

Figure 2.2. The theorical model of the spelling to dictation (adapted from Tainturier 2019).



Over the last decades, several stage models have been proposed to identify the different strategies that children are going to use in reading and spelling at the different stages (Chall, 1996; Ehri & Wilce, 1985; Juel, 1983; Ehri, 2005; Ehri & McCormick, 1998; Frith, 1985; Mason, 1980; Gough & Hillinger, 1980). From these models, researchers achieved the consensus that the acquisition of reading and spelling skills followed a roughly similar

developmental trajectory, which is from larger unit, salient visual features, to smaller unit, graphophonemic analysis.

According to the Phase Theory, one of the predominant models of early reading development proposed by Ehri (2005). In this model four phases are defined, the prealphabetic phase, the partial alphabetic phase, the full alphabetic phase, and the consolidated alphabetic phase (Ehri & McCormick, 1998). When children first start to learn to read, the prealphabetic phase, they will mainly depend on idiosyncratic graphic features of spelling to read the words, which is caused by limited letter-sound knowledge. For example, children could recognise the yellow logo of McDonald's without actually being able to read the word. During this stage, children have already started to build upon letter knowledge. Then, at the partial alphabetic phase, children have some letter knowledge and are able to use partial letter cues. Normally at this stage, children could read out the initial letter and guess the pronunciation of the given words but cannot decode the words systematically. Till the full alphabetic phase, children could work on grapheme-phoneme correspondence rules to match up the letters with the pronunciations. For example, children could blend 'c', 'a' and 't' as /kæt/ and sound the word out. However, at this stage, they will encounter problems with irregular words. That is, they would probably spell 'yacht' as 'yot' because they mainly depend on the grapheme-phoneme correspondence rules. When children move from the full alphabetic phase to the consolidated alphabetic phase, the automaticity of recognising words has been gained and they are able to use letter patterns and combinations such as morphemes (affixes and roots) and onsets and rimes efficiently, which help them to become more fluent readers and also reduce their memory load.

This model explicitly explains how children gradually develop their abilities to read and spell single words rapidly and automatically and to ultimately become relative skilled readers. Once the children meet a word, they could apply various skills to process the word. One skill that the children would use is decoding skill (Yin et al., 2007). That is,

children would like to identify and sound out each grapheme and then blend into phonemes, or children would like to separate the words into larger chunks and then associate these chunks with recognisable words to read out the words. Another skill is analogy, which is to use similar words that the children have already acquired to read out new words (Ziegler & Goswami, 2005). Children will apply the pronunciation rule of the known word *light*, for example, to attempt to read the novice word *tight*. Besides, when children encounter new or unfamiliar words, they use semantic information to guess the word is *tight*, and then use the grapheme-phoneme correspondence to confirm the pronunciation (Goswami, 1986; Tunmer et al., 1998). However, in order to read fluently, a proficient reader also needs to create a large sight word vocabulary. That is, once readers have sufficient decoding skill, analogy skill and semantic information, they could use some or all of the strategies to recognise unfamiliar words by analogy the words to the words that they have already acquired and then apply grapheme-phoneme correspondence to read out these words. So in Ehri's (1995) work, she added a fifth phase, which is known as the automatic-alphabetic phase, to explain proficient word reading. In this phase, children could recognise both novice and known words. Most of the words that children confront at this stage are the words that have already been stored in their sight vocabularies. They, hence, could process these words without effort. Ehri (1995) suggests that the core of the acquisition of reading and spelling is to make sure the words are recognised, decoded and acquired rather than purely rely on the rote memory process. Actually, it is a process for children to build more systematic connections between orthographic information and phonological information.

2.1.3 The characteristics of Chinese

As one of the Sino-Tibetan languages, Chinese language is a collection of eight dialect groups, which are Mandarin, Cantonese, Wu, Southern Min, Northern Min, Hakka, Hsiang and Kan, and all these Chinese dialects share the same written language. Moreover, the native dialect of over 70% of the Chinese population is Mandarin and it has been promoted as the national language (Chang, 1987). From this aspect, as the most spoken language among the Chinese population, the research that focuses on Mandarin language

acquisition process is meaningful. Therefore, in the current research, we turn to maintaining our focus on the differences between Mandarin Chinese and English writing systems.

Chinese is a logographic script in which the basic writing unit is the character, which corresponds semantically to a morpheme and phonologically to a syllable, rather than to a phoneme in the spoken language (Hoosain, 2013; Tong et al., 2017). Chinese words are composed of one or more characters. For example, the two-character word 毛衣/mao2 yi1/ meaning "jumper" is composed of the first character 毛 /mao2/ (character on the left), which means "fur," and the second character 衣 /yi1/ (on the right), which means "clothes." Both component characters are free morphemes in that they have consistent pronunciations and they can act as words on their own. They can also combine with other characters to form other words. For example, 毛 /mao2 / can combine with 巾 /jin1/ to form 毛巾/mao2 jin1/ (towel) and 衣 /yi1/ can combine with 外 /wai4/ to form 外衣 /wai4 yi1/ (jacket). Tan and Perfetti (1999) estimated that one-character words make up 34% of the Chinese words, whereas about 64% are two-character words (based on a 13,101,000 word corpus from mainland China; Huang & Liu 1978).

Unlike words in an alphabetical language such as English, there is no space demarcation in Chinese compound words in the text. All characters, whether unitary or compound, appear as a continuous concatenation. Theoretically, there are two possible ways of reading Chinese compound words: reading character by character (character level reading), or reading as a whole (word level reading). For example, the compound word 毛衣 /mao2 yi1/ can be read from left to right as characters 毛 /mao2/ (fur) and 衣 /yi1/ (clothes), or as the whole meaning "jumper." Individual Chinese characters are not made visually more complex by inflectional markings (Li & Thompson, 1981). Spatially, each

character occupies a fixed space and packs into a square configuration irrespective of the number of strokes of the character, which is remarkably complicated than English (see Figure 2.3; Ruan et al., 2018). Hoosain (2013) indicated that there are about 620 stroke patterns in Chinese characters and each character contained more visual information than English (e.g., the number of strokes and the spatial configuration). When novice learners start to learn to read and write Chinese, they have to distinguish individual strokes of the character visually. That is, the written system of Chinese emphasise the importance of visual structure and configurations in the character recognition process (Tong & McBride-Chang, 2010). Therefore, one of the requisite skills for the acquisition of Chinese is the visual-orthographic skill, as demonstrated in empirical research evidence (; Tong & McBride-Chang, 2010; McBride-Chang et al., 2006; Holm & Dodd, 1996). Ho et al. (2003) used a pseudoword spelling task that assessed children's understanding of positional and functional regularities of Chinese radicals. From the results of their study, they found children's performance on this task was strongly related to their Chinese word reading performance, a result highlighting the strong association between visual-orthographic knowledge and reading ability.

Figure 2.3. The homophones of qing in Chinese.

There is also evidence that visual discrimination and memory measures are associated with Chinese word reading (Huang & Hanley, 1995). This is because there are

approximately 370,000 characters within the dictionary (Zhu, 1997), and 4575 of them are used for modern-day usage only (Modern Chinese frequency dictionary, 1986). An individual needs to master 3,000 frequently used Chinese characters with different visual patterns and strokes to become a skilled reader. This is normally achieved by the end of Year 3 based on the requirements of the National Curriculum in China (Shen, 2014). In school, children are taught to read Chinese using a ''look and say'' strategy that emphasises visual analysis and rote learning for word recognition, so that characters and words are relatively holistically memorised (McBride, 2015). Moreover, Pinyin is taught and used to aid learning Chinese characters at the early stage of Chinese acquisition. Since Year 3, pupils are required to learn characters by writing repeatedly and at the same time reciting the meaning and pronunciation of the characters (Yongbing, 2005). Researchers have also argued that visual skills contribute to learning to read Chinese. Certain studies have demonstrated a higher correlation between pure visual skills and word recognition in Chinese as compared to English (e.g., Ho & Bryant, 1999; Huang & Hanley, 1997; Mann, 1985). This is reasonable given the much greater visual memory load that Chinese characters required for memorisation (e.g., Nag, 2011).

Another characteristic of Chinese is that it is commonly perceived as a morphemic language. That is, each character could be mapped to one morpheme rather than to an individual phoneme in English and embeds semantic information (Kuo et al., 2014). Specifically, the majority of Chinese characters are compound characters that consist of two components: a phonetic radical and a semantic radical, which closely connects written form with meaning (Tan & Perfetti, 1999: Perfetti et al., 2005). For example, 女 is a simple character pronounced */nv/3* (the number represents one of the four tones in Mandarin Chinese) and has the meaning *female*. The character 马(*/ma/3*) means *horse*. These two characters combine with semantic radical *nv3* on the left and phonetic radical *ma3* on the right to produce the character 妈, pronounced */ma/1*, which has the meaning mother. Thus, this compound is related in meaning to its left radical and in pronunciation to its right radical, and the character '妈 'has both valid semantic and phonetic radicals. Due to this characteristic of Chinese, at the character level, a precise analysis of radical

information is important for distinguishing the character from other characters. It would be helpful to compare this character to other known characters which contain the same semantic radical and then read the character out (Marton et al., 2010). In addition, some Chinese researchers advocate making use of radical analogies early in order to facilitate children's use of radical knowledge in learning new characters (Leong et al., 2011). Previous research indicated Chinese children show the ability to generalize both phonetic radical information to guess at the sounds of new characters and semantic radical information to guess at the meanings of new characters even in first grade (Ho & Bryant, 1999). In an 8-week intervention study, Chinese kindergartners who were explicitly taught about semantic radical functions excelled in writing skills over a control group as well (Lam & McBride-Chang, 2013). Thus, the functions of radicals are clear from a very early age in Chinese learners.

Although empirical research evidence indicated that about 80% to 90% of present-day characters are compound characters, individuals could only read 38% of compound characters correctly with the help of phonetic radicals (Shu et al., 2003; Li, 1993). There is a higher possibility for readers to obtain the meaning of the character from semantic radicals rather than the role of phonetic radicals for the pronunciation of the character. This is the reason why the Chinese writing system has historically been regarded as a meaning-based rather than speech-based language. Perfetti and his colleagues further pointed out although learners could access phonetic and sematic information from radicals, they are not reliable enough to support reading and spelling activities (Perfetti et al., 2005). Therefore, other skills are needed to support Chinese word reading and spelling achievement.

As mentioned above, most of Chinese words, approximately 65% or so, in Chinese are comprised of two or more characters (Tan & Perfetti, 1999). Lexical compounding is often used to form complex words in Chinese. Moreover, the semantic structures of the formed words are relatively transparent. For example, a single Chinese character meaning tea can

be composed of a four-character compound word such as jasmine tea or cold lemon tea. The meaning of both these compound words can be derived from the single character representing tea. Hence, the salient semantic transparency of formed words facilitates children to access the meaning of unknown words based on given known words. To be sensitive to the meaning of an identical syllable across word contexts and visual discrimination patterns of different characters are the primary strategies used by Chinese children. Of these, the meaning-based word context strategy is most commonly used. Given the morphologically based nature of Chinese, morphological awareness tends to be strongly correlated with Chinese word reading performance across the beginning and advanced readers, as demonstrated in past studies (e.g., McBride-Chang et al., 2003; Shu et al., 2006), longitudinally associated with learning to read Chinese (e.g., Lei et al., 2011; McBride-Chang et al., 2011), and even promotes Chinese word reading in some training studies (Chow et al., 2008; Zhou et al., 2012).

According to the universal phonological principle (Perfetti & Tan, 1998; Perfetti et al., 1992), readers activate multiple levels of phonology in all writing systems when they encounter printed words. Even though Chinese is a morphosyllabic system, the universal phonological principle also applies to Chinese. Specifically, in order to facilitate the initial learning of pronunciations of Chinese characters, the alphabetic script, Pinyin, was introduced to code the pronunciations of Mandarin (Chen et al., 2004). Since 1990, six-year-old children in mainland China are required to learn Pinyin before they start to learn Chinese characters. Pinyin has 23 first consonants, 36 rimes and 2 final consonants. That is, in comparison to English, Mandarin has a simpler phonological structure that always includes more open syllables (consonant-vowel syllables). Empirically, children who learn Chinese characters with the aid of pinyin have less difficulty analyzing speech into phonemes (Bertelson et al., 1999; Cheung & Ng, 2003; Cheung et al., 2001; Read et al., 1986).

Moreover, experimental evidence in recent years has also demonstrated that the syllable is a more reliable phonological unit compared to phonemes in the successful acquisition of Chinese word reading (e.g., McBride-Chang & Ho, 2000; McBride-Chang et al., 2008). Some studies have also shown that Chinese readers that have learned Pinyin system have better phonological awareness skills than those who have not (Leong et al., 2005; McBride-Chang et al., 2004).

In contrast to alphabetic orthographies, the term, grapheme-phoneme correspondence, is not used in Chinese as the smallest unit of Chinese language is syllable. The syllable structure is normally included an onset and a rime, which is relatively simple. Because the phonetic information in Chinese characters is encoded at the syllable level, substantial experimental evidence accumulated in recent years has demonstrated that the syllable is a particularly reliable phonological unit in explaining early success in Chinese word reading (e.g., Pan et al., 2011; Zhang et al., 2013). Despite evidence showing that phonological awareness is important for early reading acquisition in Chinese, its contribution to reading in higher grades has been questioned (e.g., Liao et al., 2008; Tan et al., 2005). However, ignoring the tone factor, there are 420 distinct syllables mapped onto about 4,574 characters. On average, 10-11 characters are sharing the same pronunciation (Lee, 2007). Due to the gaps in syllable distributions, another characteristic of Mandarin is that it has pervasive homophony. In Figure 2.3, all the characters are pronounced as qing but they are visually different and have different meanings. In some severe scenarios, more than 200 distinct characters share the same pronunciation (Language and Teaching Institute of Beijing Linguistic College, 1986). Therefore, the phonological assembly that occurs when phonemes are activated by graphemes and "assembled" into a spoken syllable in alphabetic processes, is not possible in Chinese characters reading processing (Perfetti et al., 2005: 45). Tan et al. (2005), for example, found that syllable deletion did not account for unique variance in character recognition in intermediate readers, after controlling for nonverbal IQ and RAN. A possible explanation may be that syllable deletion is relatively easy and has limited variability in upper elementary grades (see McBride-Chang et al.,

2004, for a similar problem). Thus, it remains unclear if more sensitive phonological awareness tasks would predict Chinese reading in higher grades or in skilled readers.

In order to understand the development of the language learning process across languages, both researchers and language educators have put a lot of efforts into the psycholinguistic area. The theoretical framework of English and Chinese language processes will be illustrated next. Subsequently, the factors that contribute to the language learning process will be discussed.

2.1.4 Theories of reading and spelling of Chinese

As aforementioned, various skills (e.g., phonological, orthographic and visual skills) are involved in Chinese reading and spelling processes. There is, however, no consensus as to the roles of these skills in Chinese characters identification and recognition processes (Liao et al., 2008). In the early 1990s, enormous research evidence robustly indicated that, in Chinese character recognition, phonology does not play a vital role, which is in contrast to the word recognition of English and other alphabetic languages (Siok & Fletcher, 2001; Chen et al., 2009). In English writing system, readers could map each letter in a word into phonemes and assemble the phonemes into a pronounceable word. As a morpho-syllabic language, researchers believed that the meaning of the Chinese character would be first activated, followed by phonology, which is known as Identification-without-Phonology Hypothesis (Hung & Tzeng, 1981). That is, after being exposed to the written output, readers would like to activate the visual-orthographic pathway to get to the meaning system directly without passing the phonological pathway (Spinks et al., 2000). This hypothesis is supported by the nature of Chinese writing system, in which Chinese readers could map orthographic units into morphemes rather than direct pronounceable units (Tan & Perfetti, 1999; Hoosain, 1991). This hypothesis suggests that Chinese reading and spelling processes would rely more on visual strategy rather than phonological strategy (Holm & Dodd, 1996).

After the topic has been studied intensely, the Identification-without-Phonology Hypothesis has received more criticism. A growing amount of literature endorses the powerful role of phonological awareness in the acquisition of Chinese reading and spelling (Hung et al., 1992; Booth et al., 1999; Koda et al., 2014; Hsu et al., 2019). Identification-with-Phonology Hypothesis, hence, has been proposed (Perfetti & Zhang, 1995; Perfetti & Tan, 1998). This hypothesis suggests that phonological process of Chinese, as of English, is an essential constituent of word recognition, especially at the lexical level.

2.1.5 Acquisition of English Reading and Spelling Skills

Perfetti and Marron (1998) mentioned that literacy acquisition is the learning process for people to understand how their writing system works. For researchers and educators, debates have gone far beyond how people can become skilled readers to comprehend text, read and spell words with ease (Ehri, 2005). After the past decades, numerous longitudinal and linguistic studies indicated that, for both children and adults, phonological awareness is one of the most important skills for learning to read in alphabetic language systems (Wagner & Torgesen, 1987; Goswami & Bryant, 1990; Wagner et al., 1997; Swanson, 2003). Specifically, phonological awareness does not only let the readers be able to manipulate sounds and letters but also able to memorise phonological information and access lexical items using phonological routes, which are all vital to the acquisition of reading (Wagner & Torgesen, 1987).

In terms of spelling acquisition, similar to reading, it also requires an individual to have sufficient knowledge of letter names, functional units of letter clusters, blending all phonemes in the words, segmenting words into smaller units (e.g., phonemes and syllables), and converting phonemes into orthography (Egan & Tainturier, 2011). Phonological awareness has been consistently demonstrated as the precursors of

subsequent spelling ability in English (Muter et al., 2004; Hulme et al., 2012). However, as an inconsistent language, it is often the case that one phoneme could be associated with not only one spelling (e.g., the long vowel /i:/ can be spelt as 'ee', 'ea', 'e-e' and 'y'). Therefore, if the child employs phonological awareness alone in spelling activities, it would result in phonologically plausible errors and increase the spelling times, which will further lead to deficiency in the spelling process (Tainturier, 2019). Therefore, with the attainment in spelling, children are gradually aware of the orthographic and morphological characteristics are also important. These pieces of evidence were supported by the theoretical accounts that were mentioned above. That is, when children grow older and are exposed to the language more, they are consciously shifting their reliance on phonological skills to orthographic processing skills to assist them in achieving accuracy and sufficiency in spelling activities (Yeong et al., 2017).

2.1.6 Word Reading and Spelling in English Monolinguals

Theoretical models and theories (e.g., Phase Theory; Ehri, 2015) suggests that the phonological quality of children's reading and spelling is a good predictor of their vocabulary knowledge and literacy development process (Treiman et al., 2016). A wealth of converging evidence indicated that phonological awareness skills are related to effective English reading (e.g., Ziegler & Goswami, 2005; Melby-Lervåg et al., 2012) and spelling (e.g., Vellutino et al., 2004; Fracasso et al., 2016) for English monolinguals. The failure of development of phonemic awareness would result in reading and spelling difficulties, which could further severely cause lower academic performance (Chung & Ho, 2010). Lonigan and colleagues (2000), for example, pointed out that phonological awareness is the strongest predictor of reading ability in English monolingual children, which could explain over 50% of the variance of reading ability. For spelling, in the longitude study of Caravolas et al. (2001), phonological awareness is one of the strongest indicators of spelling ability in children.

However, from the theories of Ehri (1986) and Frith (1985), they indicated that young children would only predominantly depend on phonological awareness in the first few years of learning to read and write. Studies (Treiman et al., 1994; Deacon & Bryant, 2006; Sun & Kemp, 2006) found that, around Year 1 (around 5 to 6 years old in the UK), then children start to employ more advanced linguistic skills (e.g., morphemes, semantics) to assist their reading and spelling. Moreover, researchers (Carlisle & Stone, 2005; Deacon et al., 2010) suggest that 7 to 10-year old children are more likely to employ morphological structure when they need to read and spell derived words. This is because children are expected to become more fluent readers with the literacy development process (Bowers et al., 2010), they would increasingly use morphemes (e.g., prefixes, roots and suffixes) as a more efficient tool for reading and spelling activities. An influence of morphological knowledge has been observed in predicting unique variance in the real word and pseudoword reading (Roman et al., 2009), general spelling (Deacon et al., 2009), vocabulary knowledge (Carlisle, 2007) and reading comprehension (Deacon & Kirby, 2004) in English monolinguals.

In addition, in skilled reading and spelling, individual words would be automatically activated in long-term memory with the pronunciations and meanings in a single step. Word recognition shifts from slow serial and sublexical process of letter strings to the fast parallel process of the whole words. In order to achieve this stage, readers are supposed to recognise words automatically with less naming time. In line with this view, rapid automatised naming (hereafter RAN), the ability to name highly familiar stimuli (e.g., letters, colours, digits and objects), has been demonstrated as a strong predictor of reading accuracy and spelling performance of English children (Kirby et al., 2010; Manolitsis et al., 2011; Furnes & Samuelsson, 2011; Georgiou et al., 2008; Moll et al., 2014). However, there are also several studies that have shown that RAN is not a predictor of spelling performance (Torppa et al., 2016; Georgiou et al., 2016) and RAN is only significantly related to reading speed rather than reading accuracy (Araujo et al., 2015; van den Bos et al., 2002). From this aspect, the relationship between RAN and reading and spelling abilities and the influence of RAN on reading and spelling are still debated

(Stappen & Reybroeck, 2018). Researchers, hence, have insisted that exploring these relations could help both researchers and educators better understand the underlying reading and spelling processes (van den Boer et al., 2016; Georgiou et al., 2016).

2.1.7 Word reading and spelling in cross-linguistic contexts

From the previous section, the large volume of considerable evidence on English reading and spelling acquisition processes and the factors that contribute to the performance of English reading and spelling for English monolinguals. As the increasingly global world demands more people to communicate in different languages, in the past decades, more researchers turn their attention further to the second language learning system. However, the nature of the relationships between L1 and L2 is still opaque, especially between two languages from different language systems such as Chinese and English (Li et al., 2018). From the linguistic interdependence hypothesis (Cummins, 1979), the development of first language and second language can depend on each other. Specifically, the development and acquisition of first language could influence that of a second language. In relation to the linguistic interdependence hypothesis, research evidence suggested that similar linguistic skills (e.g., phonological awareness, morphographic awareness) are participating in the literacy acquisition process from linguistically diverse L2 learners when compared to native English speakers (Leong et al., 2005). These overlaps in the reading and spelling performances of children across two language systems are always perceived as "transfer" (Ho & Fong, 2005; Chung & Ho, 2010; McBride-Chang et al., 2012).

One of the important findings from cross-linguistic studies is that the literacy skills that are employed in the acquisition of L1 could be transferred to L2 or vice versa (e.g., Greek-English: Niolaki & Masterson, 2013; Spanish-English: Goodrich et al., 2014; German-English: Sabourin, Stowe & De Haan, 2006; Russian-German: Edele & Stanat, 2016).

Phonological awareness in L1, for example, has been demonstrated as the strongest longitudinal and concurrent indicator of ESL (English as a second language) learners'

reading skills than other factors (e.g., morphological awareness, orthographic knowledge) in L2 (Vellutino et al., 2004). Kremin et al. (2019) recruited 33 English monolingual children and 37 Spanish-speaking children aged from 6 to 13 to explore the relations of phonological awareness, morphological awareness and vocabulary with reading. They found that the performance of bilingual children on both Spanish and English phonological awareness was strongly related to English reading accuracy. The results are consistent with previous cross-linguistic studies that phonological awareness in the first language could be transferred to the second language and have a significant influence on the reading ability of bilingual children in both languages (Durgunoğlu et al., 1993; Pérez Cañado, 2005; Kroll et al., 2015; Pasquarella et al., 2015).

In the study of Kremin and his colleague (2019), morphological awareness, similar to phonological awareness, is observed as a predictor of bilingual children's reading ability in both languages. The transfer effect, hence, is observed from Spanish to English, but not from English to Spanish as the grapheme-phoneme correspondence of Spanish is more predictable and transparent than that of English. The result further indicates that morphological awareness is also a contributor to reading success, which is consistent with substantial empirical evidence from diverse alphabetic language backgrounds (Finnish: Müller & Brady, 2001; Italian: Burani et al., 2002; French: Lafrance & Gottardo, 2005).

However, the majority of cross-linguistic studies were conducted with young children from alphabetic languages such as English, Spanish and Finish. In addition, these studies prefer to focus on preschool children, the 'golden' age that the most dramatic changes in language development take place. The phonological awareness, especially phoneme awareness, of preschool children will be developed rapidly after they have been taught to read and write (Smith et al., 1991; Ziegler & Goswami, 2005). Therefore, many researchers would like to focus on preschool subjects to get a better understanding of the language development process.

As mentioned in the previous section, compared to the phonological structure of English, Mandarin has a relatively simpler structure, but it has a complex orthographic structure. These characteristics of Mandarin enable learners to rely more on orthographic and visual information rather than phonological information to process reading and spelling activities (Wang et al., 2003). As Mandarin is a morphemic language, visually distinct characters are mapped to morphemes rather than phonemes in English, which would further encourage learners to use whole word recognition skills to read and write (Perfetti & Dunlap, 2008). By applying the whole word recognition strategy, learners could accumulate their understanding of the convention rules between written symbols and sounds, which could further strengthen orthographic skills (Roman et al., 2009). Tong et al. (2009) assessed Chinese character recognition, Chinese spelling, morphological and phonological awareness and orthographic knowledge in Chinese of 171 Cantonese-L1 kindergarten children aged 5 to 6 years old in Hong Kong. After controlling for age and vocabulary knowledge, orthographic and morphological awareness were significant predictors of Chinese reading both concurrently and longitudinally, which supports the view that Chinese literacy acquisition relies more on orthographic information and morphological awareness than phonological awareness of the nature of the Chinese language. Similarly, Yeung et al. (2011) also pointed out that orthographic skills, morphological awareness and RAN, but not phonological awareness, significantly contributed to Chinese word reading and spelling in 6-year-old first graders (see also Siok & Fletcher, 2001). This research evidence suggests that in terms of linguistic skills that underpin literacy acquisition Chinese-English bilinguals and English monolinguals would choose different skills based on the phonological structures and the characteristics of orthography of Chinese and English (Cheung et al., 2001; Liow & Poon, 1998; Yeung et al., 2011). However, these studies were conducted with Chinese children in Hong Kong, where no alphabetic script is used to facilitate Chinese literacy acquisition. This might be the plausible reason that Chinese phonological awareness was not found as a predictor of Chinese reading. Previous studies conducted with Mandarin-L1 children demonstrated that phonological awareness accounts for unique variance in character recognition and early reading acquisition in

Chinese (mainland-China: Tan et al., 2005; Pan et al., 2011; Zhang et al., 2013; Taiwan: Liao et al., 2008). Wei et al. (2014) conducted a study to investigate the relationship between Chinese reading skills and phonological skill, morphological skill and orthographic awareness with 411 Mandarin-L1 children from preschool to Grade-3. The results from their studies indicated that in the early stage of Chinese reading acquisiton, orthographic knowledge is the most important factor. When the children have experienced more reading activities, they started to rely more on phonological awareness from Year 2 because the onset-rime awareness could be used efficiently to make orthographic analogy. Later on, when children progress to Year 3, morphological awareness became the predominent factor for the acquisiton of Chinese characters. This developemt process is similar to the Stage Theory of English reading acquisiton that was proposed by Ehri (1995), which suggested that Mandarin-L1 children might follow a similar literacy development process as their English-L1 peers.

These results indicated that Cantonese-L1 children and Mandarin-L1 children demonstrated different patterns for word reading in Chinese. The traditional characters used in Hong Kong contain more complicated visual information compared to the simplified characters used in mainland China, and Cantonese does not have the alphabetic script to facilitate Chinese acquisition. Therefore, Cantonese-L1 children rely more on orthographic knowledge and morphological awareness but not on phonological awareness in the Chinese acquisition process. Even Mandarin-L1 children from Taiwan also use traditional Chinese characters, they use the alphabetic script, Zhuyin, to aid Chinese learning. With the help of the alphabetic scripts, Chinese children from mainland and Taiwan have developed better phonological awareness than children from Hong Kong. That is the plausible reason that phonological awareness is a predictor of Chinese reading for children from mainland and Taiwan but not for Hong Kong children.

Currently, we have already built up knowledge about the linguistic skills that contribute to the acquisition of Chinese literacy. As for research on bilingualism that the two languages

are distantly related such as English and Chinese, only a small amount of studies was focused on the relationships between cognitive and metalinguistic processes and reading and spelling abilities, which is crucial for successfully L2 literacy development (Xue & Jiang, 2017). Research on bilingualism suggests that bilinguals would like to choose the optimal linguistic skills of their first language to use when they need to acquire their second language, which might differ from monolinguals (Yeong et al., 2017). Yin, Anderson, and Zhu (2007) indicate that, however, children whose first language are Chinese would adopt similar stages routes and as English monolingual children during the English acquisition process.

Compared to studies conducted to examine English L2 acquisition among preschool children, scarce studies have focused upon adult bilinguals' cognitive and linguistic skills and the relationships to the English literacy acquisition process. For example, in the work of Holm and Dodd (1996), they recruited university students from China, Hong Kong, Vietnam, and Australia on a wide array of phonological awareness, reading and spelling tasks. They indicated that, after controlling for the proficiency of English, the Cantonese-L1, which is without Pinyin taught Chinese, adults from Hong Kong demonstrated poorer phonological awareness, but better visual analytic skills compared to the other language groups. This is caused by the nature of Cantonese that lack of alphabetic script, which further limited their development of phonological awareness. Therefore, the skills that are not vital in L1 are less likely to be transferred to L2. Taiwanese Chinese L1 university students also showed a similar pattern (Jackson, Lu & Ju, 1994). After testing their orthographic skills and phonological awareness, they scored significantly lower on the phonological tasks than their English monolingual peers (see also Wang et al., 2003). These results are consistent with findings from studies on Chinese L1 children showing that, compare to English native speakers, Chinese-English bilinguals have relatively limited phonological awareness, and orthographic skills are stronger contributors to English literacy activities.

Neuroimaging studies also demonstrate that different brain areas would be activated when the individual is asked to complete English and Chinese reading tasks. Tan et al. (2004) recruited eight Mandarin-L1 university students, ranging in age from 19 to 23 years, to investigate the neural representation of Chinese characters. All participants were asked to view a list of two-character words and decide whether the word was a real Chinese word. In their study, fMRI scanning was used to detect the activation of the brain areas when the participants were asked to complete lexical decision tasks. Tan and his colleagues found that both right-hemispheric and left-hemispheric activations were involved in Chinese word processing activity due to the orthographic features of the Chinese language. The Nelson et al. (2005) study assessed reading in both Chinese and English of Chinese-L1 ESL bilinguals and English-L1 learners of Chinese. The fMRI results found that the English-L1 adults showed a bilateral occipital and occipital-temporal activation, which is considered a Chinese pattern, when they were required to read Chinese characters but only activated left superior-temporal, for English reading. However, Chinese-English bilinguals showed bilateral occipital and occipital-temporal activation in both English and Chinese reading. These differences indicated that English readers would accommodate their skills to process different languages and Chinese readers preferred to use their first language skills to support their second language reading.

Though these few studies suggest that adults may apply a lexical (i.e., whole-word/ orthographic) strategy gleaned from their L1 to the learning of English as an L2, the Chinese-L1 bilingual adults recruited for these studies either had less exposure to English than their English monolingual counterparts or their literacy abilities were not comparable, which could potentially explain the differences found. Hence, the question remains as to whether Chinese-L1 adults who have been exposed to English for a similar length of time, compared to English-L1 and English monolingual adults and who are as skilled in English literacy, continue to have poorer phonological skills and to rely more on orthographic skills.

As discussed above, there is no consensus on the role of phonological awareness and orthographic skills in Mandarin-English bilingual adults' English acquisition process. Weber-Fox and Neville (2001) conducted an electrophysiological (ERP) study to examine the neural process of Chinese-English bilinguals and English monolinguals when they were exposed to English stimuli. They found that if the bilingual were exposed to the second or other languages after age 4, their brain response to the grammatical structure will be different from native speakers because the first language development has been achieved as early as 3 years old. That is, exposure to the second language at a late age would be less optimal for bilinguals to master their new language.

In China, children normally start to learn English from Year 1 (around 6 to 7 years old), which already missed the most sensitive period of language development. As the nature of Chinese and transfer effect from L1 to L2, visual recognition skill and orthographic skills are the predominant predictors of English reading and spelling acquisition processes For the acquisition of Chinese, visual analytic abilities contributed most to reading and spelling abilities in this process (Holm & Dodd, 1996; Wang & Geva, 2003; Leong et al., 2005). The majority of empirical research, however, has focused on school-age children (Smith et al., 1991). Little of this research examined cognitive and linguistic skills that contribute to English reading and spelling abilities of adult Mandarin-English bilinguals (Yeong et al., 2016). From this aspect, Chinese-L1 graduate students who are attending higher education in English-speaking countries would probably meet English language learning problems. By conducting studies about reading and writing processes of adults could obtain a better understanding of the stage model of reading acquisiton in English, especially the understanding of the automatic-alphabetic phase in this model. Such studies could also help researchers to understand the second language acquisition process when the two languages are persistent disparate. Another practical implication of this kind of study is to provide practical guidance for competent teaching and instruction, which could further facilitate the establishment of educational policy and curriculum design (Moats, 2009). If ELL learners could receive efficient English instruction, their English proficiency could be further improved, which could also lead to better academic performance and higher self-

esteem (Hess et al., 2003). Therefore, identifying factors that influence the second language learning process for adults is noteworthy and has significant educational and research implications.

2.2 Purpose of Study 1

The main purpose of this study was to examine what cognitive-linguistic skills would be significant predictors of English reading and spelling abilities for English monolingual adults and Mandarin-English bilingual adults. empirical evidence suggested that phonological awareness is the strongest predictor for English reading and spelling skills as English is an alphabetic and inconsistent language. Therefore, it requires advanced phonological awareness (at phoneme level) to complete reading and spelling activities. However, most research has a focus on the reading and spelling development of children, as their linguistic skills are still developing. In addition, studies conduct with adults are also important. Because reading and spelling will keep developing even reading and spelling compentence are achieved. In addition, the investigations on typical developed readers and spellers could provide a reference for researchers who studies individuals with reading and/or spelling difficulties. In this way, researchers could identify the weakness or impairments of atypical readers and spellers. Researchers and practitioners could therefore design more suitable interventions or treatments.

When it turns to the investigation of ESL adults, once their reading and spelling development patterns have been studied, a more holistic picture of the developmemt of English skills could be get. In this way, the differences between the development of English literacy skills of English monolingual and that of ESL/EFL. By examing the differences, it could help researchers to understand more about the characteristics of different languages. In addition, with the increasing immigration trend, more language minority children and adults will have to learn a language other than their first language. After the difference between the foreign language learners and native speakers has been identified,

researchers and practioners would be able to provide sufficient support for language difficulties encountered by individuals.

The main research question of the current study is to investigate what cognitive-linguistic factors can predict literacy skills of English monolingual adults and Mandarin-English bilingual adults. Therefore, the current study assessed phonological awareness, visual memory, orthographic knowledge, morphological awareness, RAN, working memory, reading and spelling abilities of English monolingual and Mandarin-English bilinguals. As Chinese is a logographic language, which mainly depends on whole-word recognition and visual memory skill (Holm & Dodd, 1996). However, English is an alphabetic language, even it is highly inconsistent, but phonological awareness is still a core strategy for English literacy skills.

Following are our hypotheses:

1. For Mandarin-English bilinguals, they would predominately rely on visual memory and orthographic knowledge to complete English reading and spelling activities.
2. For English monolinguals, as they are skilled readers, they would not employ their phonological awareness for real word reading and spelling. But for pseudoword reading and spelling, phonological awareness will be the strongest predictor.
3. There are possible some transfer effects from Chinese to English among Mandarin-English bilinguals.

2.3 Methodology

The current study investigated the factors that can affect English reading and spelling abilities of Mandarin-English bilingual adults. The study was a cross-sectional study that was conducted with Mandarin- and English- speaking bilinguals, and English- speaking

monolinguals. Quantitative methods were used with literacy-related assessments. The raw scores of these tasks will be used in correlational and regression analyses to examine relationships between different variables. One way ANOVA and T-tests will be also used to make comparisons between the groups. The types of reading and spelling errors will also be analysed.

2.3.1 Participants

All participants (N=73) were recruited from a University in the United Kingdom and their participation was entirely voluntary. There were two groups in this study: English monolingual (N=31) and Mandarin-English bilingual (N=42) university students. Participants who were enrolled in the Psychology Faculty were given credits for their participation, which are compulsory for them to get during their undergraduate study. None of the participants had any auditory impairment and/or visual impairment.

Monolingual English-speaking group. There were 31 English monolingual participants and their ages ranged from 19 to 33 years (mean:23.75 years, SD=4.23). They met the following criteria: (a) they were born in the UK or other English-speaking countries, (b) English is their native language with no exposure to any other languages before age five, (c) English is their parents ' native language.

Bilingual group. There were 42 Mandarin-English bilingual participants and their ages ranged from 19 to 38 years (mean:24.89 years, SD=3.24). They met the following criteria: (a) they were born in Mainland China, (b) Mandarin is their mother tongue and English is not their native language, (c) they can speak, read and write in Mandarin and English, but not in other languages. All participants were students of a Higher Education in the United Kingdom. Each subject had achieved a score of 6.5 on the International English Language Testing System (hereafter IELTS) (the University requires at least a score of 6.5 for entry)

or had completed the pre-session course in the university. All the individuals had completed at least 1 year of university study.

2.3.2 Materials

The Language Background History Questionnaire

Bilingual participants were given the Language Background History Questionnaire before any other tasks. The questionnaire was adapted from Language Experience and Proficiency Questionnaire (LEAP-Q; Marian, Blumenfeld & Kaushanskaya, 2007). It collected demographic information of participants (e.g., age, gender, education level); the length of living in the UK; the first exposure to English and Mandarin; native language of the parents; languages used at home and school; the language used between parents-child and their linguistic history before age five. Moreover, participants were asked to rate their current proficiency in both English and Mandarin by using a five-point scale was used: 1= poor and 5 = native speaker command.

Non-verbal ability tasks

All participants were first given non-verbal ability tests. There were two parts of the non-verbal task, which is Diamonds test (subtest of Wide Range Intelligence Test; hereafter WRIT; Glutting, Adams & Sheslow, 2000) and Matrices test (subtest of WRIT).

WRIT includes both verbal and non-verbal intelligence tests. However, after considering that the first language of bilingual participants is Mandarin, the verbal intelligence test is not suitable for the current participants. In addition, visual observation and non-verbal reasoning abilities measured by the non-verbal tasks are particularly important for informing fluid intelligence. Some evidence suggested that fluid intelligence, a critical skill for logical thinking ability, is essential for educational attainment in university, particularly

in complex and demanding environments (Kuncel et al., 2004). Other evidence suggested that verbal intelligence is a better predictor of language ability than non-verbal intelligence for EFL learners (Skourdi & Rahimi, 2010; Nakhrowi & Fatimah, 2019). Weber-Fox and Neville (2001) further indicated that if the individual was exposed to a new language after age 4, he/she cannot develop a ‘‘native brain” response to the grammatical structure of this new language because of interference of the first language. Therefore, only non-verbal tasks were used to measure participants’ intellectual abilities in the current study.

As WRIT is a standardized test normed on the American population sample and the participants of the current study were British and Chinese people. From this aspect, the standardized scores of WRIT were not appropriate for the current study. Hence, the total scores of these two non-verbal IQ tasks were recorded for further analyses.

Diamonds. This task was designed to measure visual perception, spatial abilities, which is important to solve new problems. Participants were placed into the item with the correct age designation. Then participants were given different chips and were asked to re-create the illustrated forms that were presented on the screen by using those diamond-shaped chips. If participants made errors on either of the first two starting items, they would be returned to the previous level. Of nine possible items, the accuracy and completion time of each item correspond to different scores. The total raw score that a participant get is to add all scores for correct items up. If participants made two consecutive errors, the test was stopped. The maximum score of Diamonds was 38 (reliability = .78 for English monolinguals and reliability = .80 for Chinese ELLs).

Matrices. This test was used to assess visual observation and non-verbal reasoning abilities. These abilities are important especially in Higher Education to inform fluid intelligence. The test was beginning at the appropriate-age item as well. In this task, an

incomplete initial picture stimulus was presented and the participant was required to choose the most suitable picture to fill in the blank from a series of pictures within certain time limits. If there were incorrect answers on either of the first two starting items, the previous age level was administrated. The discontinue rule was met after four incorrect answers within five consecutive items and the task was stopped. Of 27 possible trials, item 18 – 35 were scored as 0 or 1 points with 30-second of the time limit and item 36 – 44 were scored as 0 or 2 points with 45-second of the time limit. Participants obtained a total score out of 36 (reliability = .81 for English monolingual group and reliability = .84 for Chinese ELL group).

Single word reading and spelling tasks

After the non-verbal IQ test, reading and spelling tasks were administrated. Both English-reading and spelling tasks included real words and non-words. In reading tasks, participants were required to read 55 real words (Green Word Reading Form from Wide Range Achievement Test 4; hereafter WRAT-4; Wilkinson & Robertson, 2006) and 57 pseudowords (subtest of Wechsler Individual Achievements Test-II; hereafter WIAT-II; Glutting, Adams & Sheslow, 2000) aloud as accurate as possible (the real word reading task had reliability α = = .83 and α = .81 for English monolinguals and Chinese ELLs respectively; the pseudoword reading task had reliability = .79 for English monolingual group and α = .87 for Chinese ELL group). The words that were mentioned above were listed with increasing difficulty on the screen of the laptop. In order to present the target word and record participants answers, the DMDX software (Forster & Forster, 2003) was used with a video mode setting as 1920 x 1080 at 60Hz. A fixation cross was presented on the screen for 1000 msec, followed by a 500-msec blank and then followed by the target word, which lasted for 200 msec, in black against a white background. The fixation cross and target words were displayed in font size 14. The DMDX would automatically record participants' responses with the built-in microphone for each word, which were used for later verification. The accuracy and reaction times, which were extracted from the audio

files using the Checkvocal software (Protopapas, 2007), are included in the further analysis.

In spelling tasks, participants were informed that they would be listening to 27 real words (subtest of WIAT-II; reliability $\alpha = .80$ for monolingual group and $\alpha = .81$ for Chinese ELL group) and 40 pseudowords (subtest from Castles and Coltheart Test 2; hereafter CC2; reliability $\alpha = .81$ and $\alpha = .78$ for monolingual and Chinese ELL groups respectively) and they needed to write all these words down. The total reaction time of each spelling task (from start to finish) were captured for further analyses.

Reading comprehension

In order to assess language participants 'language proficiency, the English Reading Comprehension task was administrated to all participants and the Chinese Reading Comprehension task was given to all Chinese participants.

We used the Green form of the English Reading Comprehension task from the WRAT-4 (Wilkinson & Robertson, 2006) in this study. Participants were allocated to different starting points based on their previous English reading raw score. They were requested to fill in the blank with one word after reading the whole sentence to complete the meaning of the sentence. Participants obtained 1 score for each correct answer. The total raw score was the sum of the number of correct answers and the number of items before the (baseline) starting point. The test followed 5/7 rules. That is, if a participant did not answer the first five starting items correctly, he/she was administrated to the previous level until he/she can make five consecutive correct answers. However, if a participant made seven consecutive wrong answers, the test stopped immediately (reliability $\alpha = .88$ for English monolingual participants and $\alpha = .78$ for Chinese participants). Furthermore, after considering Chinese participants 'English vocabulary might be limited, they were allowed

to write down the Chinese words when they understood the whole sentence and knew which word should go in the blank but they did not know the English word. Under this situation, participants still can obtain 0.5 points for this "half-correct" answer if they choose the correct Chinese word.

Due to the lack of standardised Chinese Reading Comprehension test, the Blue Form of Reading Comprehension from the WRAT-4 was translated into Chinese. The translator is a native Mandarin speaker and fluent in English as well. After the translation, another native Mandarin speaker with comparable English fluency did the proofreading for the whole task to make sure the translation was consistent and accurate. All participants were administrated all items from Item 1. Participants got 1 score for each correct answer and there was no discontinue rule in this task (reliability = .92).

Phonological awareness (PA)

After the reading comprehension tasks, participants phonological awareness was assessed. We administered two tests (Elision and Spoonerisms) to measure the different abilities of participants to manipulate sounds of words.

Elision. This task is the subtest from the Comprehensive Test of Phonological Processing – 2 (CTOPP – 2; Wagner et al., 2013). It measured the ability of participants to remove part of syllables or phonemes (initial, medial or final phonemes) from the given words. There were 34 items in total, nine of them needed participants to take away syllables from the given words, rest of them needed participants to take phonemes from them. Accuracy and reaction time were recorded. The discontinue rule was if a participant missed 3 items in a row, the task stopped (α = .81 for Chinese participants and α = .85 for English participants).

The Mandarin version Elision task was adapted from Hamilton (2007). Compared to the English Elision, the Mandarin Elision task only assessed participants' ability of medial deletions and deletions from consonant clusters but not cluster deletions, which does not exist in Mandarin phonological structure (Hamiton, 2007: 42). For example, participants were asked to say 壮(zhuang4), which means strong, without saying /ang/. The discontinue rule was met after three consecutive mistakes. The maximum score of this task was 48. The reliability of this measure was α = .75.

Spoonerisms. The spoonerisms test was used to test the participants' phonological awareness in English. Unlike the Elision task, participants were required to swap the first sound of two spoken words in the spoonerism task. The purpose of this task was to assess the phoneme awareness by analysing the phonological structure of each word (for example, 'Beckon Sandal 'becomes 'Seckon Bandal). The task contained 3 practice trials and 11 experimental trials. Within 11 trials, half of them were singleton consonant words and others were biconsonantal cluster words. Participants received 1 point for each correct word and obtained a total score out of 22 (α = .85 and α = .82 for English and Chinese participants respectively).

An equivalent spoonerisms test was devised in Mandarin (for example, zhu3 ti2 (theme) becomes tu3 zhi2). The task contained 3 practice trials and 11 experimental trials as well. The scoring system for the Mandarin task consisted of crediting each correct answer with 2 points and each 'peripheral 'error answer (correct Pinyin but wrong tone) with 1 point (reliability = .88).

Orthographic processing skill

Orthographic choice task. Previous studies pointed out that orthographic process skills are basic components in reading Chinese and orthographic representation are activated

before any other skills when reading Chinese (Taft, Zhu, & Peng, 1999; Perfetti & Liu, 2005). In the current study, orthographic processing skill was measured by orthographic choice tasks. The task assessed participants ’sensitivity to different patterns of English orthography and Chinese participants ’sensitivity to legality of the radical form and position of Chinese orthography.

This task was run on the E-Prime software. A fixation point (+) was presented in the middle of the screen and 700ms later, the stimulus appeared in Times New Roman font 44. A pair of non-word stimuli were displayed in black on white background each time. Participants were instructed to choose the word that was more likely to be a real word by pressing the correspondent button. That is, if a participant felt the left one looked like a real word, he/she pressed the left arrow button; if he/she felt the right one should be the correct answer, then the right arrow button was pressed. Latency (time between the appearance of words and the choice of participants) and accuracy were recorded.

English orthographic choice task consisted of 18 pairs of pseudo-words were presented on the screen of the laptop. Some of these items include illegal double consonants. For instance, ‘‘dd” will never appear at the beginning of a word. Some of these items had illegal combinations of two consonants such as ‘‘ck” combination does not exist in a word. The maximum score of this task was 18. The reliability of this test was α = .82 for English monolingual participants and α = .80 for Chinese participants.

In the Chinese task, there were 40 pseudo-characters in total. These characters were divided into two conditions: one of the paired characters included a legal radical in the wrong place and one of the characters with an illegal radical. For instance, 女 is a radical in Chinese. In the pair 好 and 好, the radical of 好 is in the wrong place; in the pair of

 and , the radical does not existed in Chinese. All illegal radicals were made by adding, removing, or changing a stoke from illegal radicals. Participants received 1 point for each correct answer and obtained a total score out of 20. The reliability of this test was α = .82.

Rapid automatized naming speed

There is increasing evidence for the importance of rapid automatized naming (henceforth: RAN) in Chinese reading (Georgiou et al., 2020) and English reading performance (Misra et al., 2004). The current study used Rapid digit naming and Rapid letter naming (subtests of CTOPP – 2; Wagner et al., 2013) to measure participants ' RAN ability.

Rapid digits naming. In this task, six numbers (2, 3, 4, 5, 7, 8) were repeated six times with a random order on a single page. There were 36 digits in total. The test included a practice trial, which showed six digits for participants to get familiar with the test prior to the experiment trial. All digits were displayed in Time New Roman font 72. Participants were asked to name the numbers as fast and accurate as possible. A stopwatch was used to record the time to completion and accuracy was recorded as well. The maximum score of this task was 36 (reliability of α = .92 for English monolingual group and α = .86 for Chinese ELL group). For bilingual students, they also needed to complete the same task in Mandarin (reliability α = .88).

Rapid letter naming. In this task, there were six letters (a, t, s, k, c, n) were repeated six times. All other settings were the same as Rapid digits naming task, the only difference was that bilingual participants did not need to do this task in Mandarin. Accuracy and reaction time were recorded (reliability α = .96 and α = .95 for English monolingual and Chinese ELL groups separately).

Visual memory

Leck, Weekes & Chen (1995) found in their study that in Chinese character recognition process, children rely primarily on visual information. Previous research found that visual skills were the most powerful predictor of Chinese reading ability in Chinese children and adults (Huang & Hanley, 1995; Holm & Dodd, 1996). Masterson et al., (2008) found that visual memory skills and phonological skills can both predict children's English spelling performance.

The current study employed two tasks to assess participants 'short-term visual memory ability – one involved familiar pictures (Design Memory) and another involved abstract visual information (Simultaneous and Sequential visual memory).

Design memory. This task was adopted from Wide Range Assessment of Memory and Learning 2 (WRAML 2; Sheslow & Adams, 2003). This task measured visual memory by using familiar but minimally meaningful elements. In this task, there were five cards and each card included an array of geometric shapes. Each card was presented on the screen of the laptop for five seconds and then there was a ten-second blank, after the blank, participants were required to draw what they remembered. The scoring system for this task consisted of crediting each correct answer on the Examiner form with 1 point and the Examiner form provided 12 possible answers for each card. The maximum score of this task was 60. Both total raw score and time to completion were recorded. The reliability of this test was $\alpha = .81$ for English monolingual group and $\alpha = .86$ for Chinese ELL group.

Simultaneous and Sequential visual memory. The visual memory simultaneous presentation assessment (developed by Hulme, (1981); adapted by Niolaki & Masterson,

(2013)) used Arabic characters, which were unfamiliar symbols to participants. The number of characters increases from 2 to 5 gradually. Each array of characters was presented on the screen of a Toshiba laptop for 10 seconds. Then a blank, which lasted 1 second in the first eight trials and 10 seconds in the following eight trials, was presented as a retention interval. After that, the test array was presented in a different order and intermixed with two new characters. Participants were asked to recall the characters in the correct order. The characters were presented in font size 14 in PowerPoint for Windows 10.

The visual memory sequential presentation assessment (developed by Goulandris and Snowling (1991); adapted by Niolaki and Masterson (2013)) used Tamil characters. The difference between the two tasks is the characters, in the Simultaneous task, will be presented on the computer screen simultaneously (reliability $\alpha = .79$ for English monolingual group and $\alpha = .82$ for Chinese ELL group)and in the Sequential task the characters will be presented sequentially ($\alpha = .80$ for English monolingual group and $\alpha = .81$ for Chinese ELL group). In the sequential task, each character was presented on the screen for 2 seconds. After a retention interval, participants needed to report the original characters in the correct order. There was no time limit on responses.

Each task contained 16 experimental trials. There were three practice trials in the Simultaneous task but no practice trial in the Sequential task. For both tasks, the trail was marked as correct only when the characters were recalled in the correct order. The experimenter used a stopwatch to record the response time of each participant. Accuracy and reaction time were included in the further analysis and obtained a total score out of 16 in each task.

Morphological awareness

Morphological construction. Empirical evidence demonstrated that morphological compound ability is a significant predictor of English reading ability (McBride-Chang et al., 2004) as well as Chinese reading ability (McBride- Chang et al., 2005). The current study employed a morphological construction task, which was developed by McBride-Chang and her colleagues (2003, 2006) and adapted by Hamilton (2007). This task assessed participants ’ability to manipulate morphemes in compound words.

In this task, participants heard the sentences with morpheme cues firstly such as ‘‘A tree that grows apples is called an appletree.” and then they were asked to make up a new compound word ‘‘What would you call a tree that grows bread?” participants were supposed to say ‘‘breadtree”. There were 30 items in total: 14 of them required word-initial substitutions (e.g., sunflower – moonflower) and the rest of them required word-final substitutions (e.g., raincoat – rainsock). Participants received 1 point for each correct answer and obtained a total score out of 30. The reliability of this test was α = .86 for English monolingual participants and α = .88 for Chinese participants.

An equivalent Morphological Construction test was devised in Mandarin (for example, ‘‘the paper that is white is called whitepaper. What would you call paper that is red?”). The task contained 30 experimental trials as well. Moreover, 15 of items required word-initial substitutions and 15 of the items required word-final substitutions. Accuracy and completion time were captured for further analyses. The reliability of this test was α = .84

Working memory

Working memory ability was found dramatically related to different reading skills in English. In context reading, working memory can help the reader to recognize words when

remembering what has been read (Siegel, 1993). Working memory is also the basis of many academic relevant activities in Higher Education, for example, spelling, reading comprehension, following conversation and instructions and math (Hagiliassis, Pratt & Johnston, 2006). The current study assessed participants ' working memory by using a task called Symbolic Working Memory.

Symbolic working memory. This is the subtest of WRAML 2 (Sheslow & Adams, 2003). It assessed participants ' ability to operate and keep symbolic information, which includes numbers and letters, before the recall. It consisted of two levels. In the first level, participants heard a list of numbers, and then they were required to recall these numbers in numerical order, from smallest to largest. In Level B, the list consisted of numbers and letters. Participants were required to recall all numbers first in numerical order and then recall all letters in alphabetical order. Accuracy and completion time were captured. Participants earned 1 point with each correct answer. There were 14 items in each level, participants could attain a total score out of 28. The discontinue rule was if the participants made 3 consecutive errors, the test stopped. The reliability of this test was α = .85 for English monolingual group and α = .86 for Chinese ELL group.

Verbal learning

Verbal learning is the ability for individuals to learn from listening to other people's talking and take information from conversation. If an individual has good verbal learning ability, he/she could express his/her emotion and solve complex problems through words in both writing and verbally efficiently (Mayer & Massa, 2003). The current study also tested the verbal learning ability of participants.

The Verbal Learning task that was used in this project was the subtest from WRAML 2 (Sheslow & Adams, 2003). In this task, participants heard a list of 16 words for four times.

Each time they were asked to remember as many words as they can. Then they were required to recall all the words that they remembered in any order. From the second time, they should recall not only any new words they remembered but also those words that they have already said in previous sessions. The total number of correct answers and intrusion errors, which indicated errors occurred when words were recalled that were not on the list, were recorded separately. The time needed to complete four sessions were captured for further analyses. The reliability of this test was $\alpha = .87$ for English monolingual group and $\alpha = .83$ for Chinese ELL group.

2.3.3 Procedure

In the current study, we explored what kind of cognitive and/or literacy-related factors can affect English reading and spelling abilities of Mandarin-English bilingual university students. In addition, we also examined that whether emergent bilingual adults and monolingual adults are relying on different processes when reading and spelling English words. These abilities were measured by a series of standardised tasks. However, there was no standardised tasks in Chinese. Therefore, all Chinese tasks were adapted from correspondent English tasks.

Ethical approval was granted by Coventry University ethics committee. When conducting the experiment, participants were assessed in a quiet room in a single session. For monolingual students, the session lasted for 1 to 1.5 hours and for bilingual students, the session lasted for 2 to 2.5 hours. In order to avoid fatigue, tiredness and lack of concentration, breaks were adopted. Participant Information Letter was given to each participant firstly and then Consent Form was given to make sure that they fully understood the study and the information on the Participant Information Letter. Once they permitted to take part in the experiment, they signed the Consent Form. After obtained the consent, participants were recommended to settle themselves comfortably in a chair in front of a laptop. All English audio files of target tasks were made by a native

female English speaker and all Mandarin relevant audio files were made by a native female Mandarin speaker. After finishing all tasks, the Debrief Form was given to each participant to increase their further understanding of the study in which she/he was involved. Data collection lasted from May to August 2017.

2.4 Results

The scatterplots of all variables as well as bivariate plots across samples demonstrated that the normality assumptions have been met and linearity was statistically acceptable (Tabachnick & Fidell, 2007). Raw scores of all standardised tasks were used for the descriptive statistics. Because the standard scores or percentiles were obtained from testing a large English monolingual population and were not normed for individuals whose first language is not English on the standardised tasks. Compared to converting raw scores into standard scores or percentiles, therefore, raw scores are more appropriate to measure the performance to avoid bias (Geva & Farnia, 2012). However, for Rapid digits naming and Rapid number naming tasks, the total time taken to complete were calculated in second. Table 2.1 displays the means, standard deviations of all tasks organised by language background group.

Preliminary analysis

ANOVAs were conducted to examine if there were group differences in all measures. There is no significant differences between the two groups on the measure of nonverbal reasoning, $F(1, 71) = 2.411$, $p = .125$, Rapid number naming, $F(1, 71) = .006$, $p = .941$, Rapid letter naming, $F(1, 71) = .2.08$, $p = .154$, Orthographic choice, $F(1, 71) = 1.05$, $p = .310$, Verbal learning, $F(1, 71) = 1.44$, $p = .234$, Symbolic working memory, $F(1, 71) = 1.13$, $p = .291$, or Design memory, $F(1, 71) = .014$, $p = .907$.

Table 2.1. Summary statistics for English monolingual and mandarin-English bilingual groups on all assessments (*standard deviations in parentheses*).

Measures (Maximum Score)	English Monolingual (n = 31)	Mandarin-English Bilingual (n = 42)
	M *(SD)*	M *(SD)*
Nonverbal IQ Test (72)	38 *(9.80)*	41.21 *(8.62)*
Simultaneous Visual Memory (16) [a]	9.45 *(1.46)*	10.60 *(2.41)* *
Sequential Visual Memory (16) [a]	10.10 *(2.94)*	11.45 *(2.36)* *
Design Memory (48)	32.16 *(6.37)*	32.33 *(6.02)*
English Elision (34) [a]	30.40 *(4.23)*	26.98 *(1.92)* ***
Mandarin Elision (48)	-	39.60 *(4.92)*
English Spoonerisms (22) [a]	16.55 *(3.50)*	12.98 *(4.85)* **
Mandarin Spoonerisms (22)	-	13.24 *(4.55)*
Rapid Digits Naming RT (ms)	12.86 *(2.12)*	12.81 *(4.55)*
Rapid Letter Naming RT (ms)	13.78 *(2.26)*	12.98 *(1.37)*
English Orthographic Choice (18)	15.90 *(1.45)*	15.55 *(1.40)*
Mandarin Orthographic Choice (40)	-	37.68 *(3.02)*
Verbal Learning (64)	43.55 *(7.38)*	41.57 *(6.64)*
Symbolic working memory (28)	22.83 *(3.43)*	22.02 *(2.99)*
English Compound Noun (30) [a]	28.87 *(1.65)*	26.98 *(1.92)* ***
Mandarin Compound Noun (30)	-	28.55 *(1.37)*
Real-word reading (55) [a]	47.23 *(4.68)*	27.69 *(7.16)* ***
Nonword reading (57) [a]	54.27 *(2.53)*	38.71 *(10.71)* ***
Real-word Spelling (27) [a]	21.13 *(3.22)*	9.60 *(4.63)* ***
Nonword Spelling (40)[a]	21.16 *(4.15)*	8.78 *(4.47)* ***
Reading Comprehension ()[a]	46.50 *(3.05)*	28.88 *(8.30)* ***

Note, RT, reaction time.
[a]Means differed significantly between English monolingual and Mandarin-English bilingual groups.
*p < .05. **p < .01. ***p < .001.

The results also indicated that monolingual adults performed significantly better than the bilingual adults on two phonological tasks: Spoonerisms: F (1, 71) = 12.13, p = .001; Elision: F (1, 71) = 12.13, p = .001. However, the bilingual group outperformed the monolingual group on Simultaneous visual memory, F (1, 71) = 5.49, p = .022, and Sequential visual memory, F (1, 71) = 4.78, p = .032. These results are consistent with the hypothesis, Mandarin-English bilingual adults have poorer phonological awareness and better visual

analytic skills due to the characteristics of Chinese. Not surprisingly, the monolingual group performed significantly better on the measures of English real word reading, $F (1, 71) = 175.20$, $p < .001$, English pseudoword reading, $F (1, 70) = 60.66$, $p < .001$, English real word spelling, $F (1, 71) = 141.61$, $p < .001$, English pseudoword spelling, $F (1, 71) = 142.75$, $p < .001$, and English comprehension, $F (1, 68) = 115.39$, $p < .001$. These results indicated that bilingual participants' English literacy skills were not as proficient as the monolingual group, which met the hypothesis that the English proficiency of bilingual participants was limited because they have only been exposed to an English-speaking environment for a limited time (91% of them stayed in the UK less than three years).

The main aim of the current study was to explore the predictive pattern of cognitive-linguistic skills for English reading and spelling abilities for English language learners. The main analytical approach, hence, was linear regression analysis. Since there is a relatively larger number of predictor variables, it might cause high levels of multicollinearity for regression analyses (Pham & Hasson, 2014). Before further examining the relationships between the cognitive-linguistic skills and English literacy abilities, the exploratory factor analysis was conducted to reduce the number of predictor variables to explore the main sources of the variance and to further increase the interpretability of our data (Tabachnick, Fidell & Ullman, 2007). All variables except for the reaction time for RAN Digits and Letters tasks were standardised within the two groups and the z-scores were used in the following analyses.

Exploratory factor analysis of literacy variables

In order to assess the sources of variability across literacy tasks, an exploratory factor analysis of the following variables: word reading and spelling tasks, was performed. The Kaiser–Meyer–Olkin test produced a value of .78 indicating that the sample size was adequate. The Bartlett test of sphericity ($\chi 2(6) = 82.80$, $p = .000$) indicated that the sample is suitable for exploratory factor analysis. Only one factor was extracted, accounting for

86.04% of the variance (see Table 2.2). This indicates that all literacy skills are highly intercorrelated in this population.

Calculating composite scores

Because the low number of errors were made on the English Compound noun task (on average, 1.13 mistakes were made by the monolingual group and 3.1 mistakes by the bilingual group), a composite score was calculated by combining accuracy scores and the speed and used in the following analyses. The total time taken to complete this task and the number of mistakes were converted to standardised scores and then averaged to form the composite score (see Yeong et al., 2016; Stanovich & West, 1989). Following a similar method, a composite score for the Orthographic Choice task was calculated using the speed and accuracy scores for each participant. The median correct reaction time and accuracy were converted to standardized scores within the whole sample and then averaged to form the composite score.

For the Mandarin tasks, a low number of errors, 1.45 mistakes, were made on average. A composite score, therefore, was created following the same procedure as the composite score of the English Compound noun task. For the bilingual group, the Spoonerisms task in Mandarin was significantly correlated with Mandarin Elision ($r = .66$, $p < .01$) and Mandarin word reading ($r = .37$, $p < .05$). But the Spoonerisms and Elision tasks in Mandarin were not significantly associated with Mandarin Compound noun task ($r = .28$, $p = .970$; $r = .38$, $p = .07$). Since the two Mandarin phonological awareness tasks have a strong correlation and have low correlations with Mandarin morphological awareness, the composite score representing Mandarin phonological awareness was created by averaging the z-scores of the Mandarin Spoonerisms and the Mandarin Elision tasks. Yeong et al., (2016) adopted a similar method to reduce the number of predictor variables.

Table 2.2. Factor loadings for literacy skills in the factor analysis.

Measures	Component
Real-word reading	.93
Nonword reading	.90
Real-word spelling	.96
Nonword spelling	.93

Note. Extraction Method: Principal Component Analysis.
Rotation Method: Oblimin with Kaiser Normalization

Exploratory factor analysis of cognitive-linguistic variables.

Following, an exploratory component analysis with the Oblimin rotation to produce oblique factors. All 11 cognitive-linguistic variables were included. Furthermore, the whole dataset included 73 participants in total. Therefore, the participant-tot-variable ratio is larger than 5, which is suitable for conducting factor analysis (Bryant & Yarnold, 1995). The Kaiser–Meyer–Olkin value at .72 exceed the recommended value of .60 (Tabachnick, Fidell & Ullman, 2007). Bartlett's test of sphericity indicated the presence of factor structure, $\chi 2(55) = 163.92$, $p < .001$. Extracted communalities were all larger than .05 but Compound noun task, which indicated that majority variables shared a substantial amount of the variance. Therefore, exploratory factor analysis was considered as an appropriate technique for further analyses.

Four components were extracted that had eigenvalues >1. By examining the scree plot, no obvious reasons to change the number of factors were detected. These four components accounted for a total of 64% of the variance (the first component accounting for 30.82% of the variance, the second for 14.89%, the third for 9.67% and the fourth for 8.52% of the variance). The first factor captured variance in Simultaneous visual memory, Sequential visual memory and Design memory representing visual memory skills and compound noun tasks. The second factor comprised of RAN digits and letters representing RAN skills. The third factor comprised of Spoonerisms, Elision and orthographic choice tasks. The final factor captured variance in Verbal learning and Symbolic working memory tasks representing working memory skills (see Table 2.3).

Table 2.3. Factor loadings for cognitive skills in the factor analysis.

Measures	Component			
	1	2	3	4
Simultaneous visual memory	**.87**	.03	-.10	.01
Sequential visual memory	**.76**	-.12	-.05	-.13
Design memory	**.70**	.17	.12	-.15
Spoonerisms	.12	-.07	**.70**	-.02
Elision	-.07	.12	**.84**	-.09
Verbal learning	.04	-.07	.03	**-.84**
Symbolic working memory	.06	.00	.02	**-.79**
Compound noun	**.37**	-.17	.30	.12
Orthographic choice	-.06	-.08	**.72**	.03
RAN digits	-.12	**.82**	.00	-.05
RAN letters	.15	**.87**	-.03	.13

Note. Extraction Method: Principal Component Analysis.
Rotation Method: Oblimin with Kaiser Normalization

Theory-driven components

The exploratory factor analysis extracted four components using a data-driven approach; however, there are two main reasons to refrain from analysing directly the resulting factors. Firstly, it is possible that the approach would fail to distinguish cognitive-linguistic skills that are theoretically important to distinguish. The third component, for example, captured two phonological tasks and the orthographic task. One of the goals of the current project is to examine the contributions of various cognitive-linguistic skills, despite their being sufficiently correlated to appear in the same factor in the exploratory factor analysis. In addition, factors defined through the exploratory factor analysis carry many minor loadings that are not theoretically interpretable, that may not be stable, and that may therefore simply add noise (Saksida et al., 2016, p.1509). From these aspects, it is preferable to define theory-driven components that are simply informed by the exploratory factor analysis. Other studies also followed a similar manner (Ramus et al., 2013; White et al., 2006).

Based on the results from the exploratory factor analysis, an overall score representing visual memory skills was obtained by averaging the Design memory and the Simultaneous

and Sequential visual memory tasks. The working memory score was created by averaging the Symbolic working memory and Verbal learning tasks. RAN score was obtained following a similar manner. Moreover, despite the results of the exploratory factor analysis, two separate components for the Orthographic Choice task and the Compound noun task were formed in order to assess it independently. This was supported by past research with both adults and children that phonological, visual-orthographic and morphological skills interact with each other to assist in the word reading and spelling processes (Tighe et al., 2019; Deacon, 2012). The phonological skills, furthermore, were obtained by averaging the z-scores of the Spoonerisms and the Elision tasks.

Relationships between metalinguistic skills and English word reading and spelling

Table 2.4 and Table 2.5 show the correlations between visual memory, phonological, morphological, RAN and working memory skills, and Mandarin-related skills (for the bilingual group only) and English word reading, spelling and comprehension for each group. The pattern of associations suggests that language background affects the relationships between cognitive-linguistic skills and English literacy abilities. An investigation of the distribution of these overall scores showed that they were neither skewed nor had excessive kurtosis and that they were normally distributed (all Shapiro–Wilk tests of normality $p > .05$).

Table 2.4. Correlations of English word reading and spelling and cognitive-linguistic measures for the monolingual group after controlling for age and non-verbal IQ.

Measures	1	2	3	4	5	6	7	8	9	10	11
1. Visual memory skills	-										
2. Phonological skills	.31	-									
3. Working memory skills	**.39***	.34	-								
4. RAN skills	.10	-.13	.10	-							
5. Orthographic skill	.00	.18	.17	-.29	-						
6. Morphological skill	.02	-.36	-.18	-.07	.15	-					
7. Real-word reading	.15	.29	-.06	-.31	.24	.17	-				
8. Nonword reading	.18	**.59****	-.15	**-.38***	.35	.05	**.59****	-			
9. Real-word spelling	-.03	.01	.08	-.03	-.02	-.10	**.39***	**.53****			
10.Nonword spelling	.29	**.55****	.12	**-.31***	**.49***	.02	**.44***	**.63****	**.33****	-	
11. Comprehension	.05	.08	.12	-.09	-.11	-.32	.08	-.07	.08	.03	-

Monolingual Group

For the monolingual group, after controlling for age and nonverbal reasoning ability, the data in Table 2.5 indicate that phonological skills were significantly correlated with pseudoword reading ($r = .59$, $p < .01$) and pseudoword spelling ($r = .55$, $p < .01$). In addition, RAN skills significantly correlated with pseudoword reading ($r = -.38$, $p < .05$) and pseudoword spelling ($r = .-31$, $p < .05$). For orthographic skill, it only significantly correlated with pseudoword spelling ($r = .49$, $p < .05$). Significant correlations were not observed between real word reading and spelling and cognitive-linguistic measures for the English monolingual adults (most likely due to ceiling effects in real word reading and spelling; e.g., Bus & van IJzendoorn, 1999; Wagner et al., 1997; Yeong et al., 2016). All four reading and spelling tasks, however, were significantly correlated with each other (all $rs > .33$, $p < .05$).

Bilingual group

As shown in Table 2.5, after controlling for age and nonverbal reasoning ability, for the English-related tasks, both phonological, visual memory and RAN skills were significantly correlated with all reading and spelling tasks for the bilingual group at levels of $r = .37$, $p < .05$ or higher, which were consistent with previous research that phonological awareness (Chan & Siegel, 2001), visual skills (Yeong et al., 2016; Huang & Hanley, 1994) and RAN (Cho & Chiu, 2015) are significantly associated with English word reading and spelling abilities of Chinese-English bilinguals. Phonological skills had stronger associations than visual memory skills and RAN skills with pseudoword reading and both spelling tasks. Morphological skill was significantly related to real word spelling task ($r = .44$, $p < .01$) and pseudoword reading task ($r = .39$, $p < .05$), and a marginally significant correlation with real word reading ($r = .30$, $p = .06$). As for working memory skills, the significant associations were observed with real word reading ($r = .35$, $p < .05$) and pseudoword spelling ($r = .36$, $p < .05$), and a marginally significant correlation with real word spelling ($r = .31$, $p = .06$). In terms of reading comprehension ability, it was significantly correlated

with bilinguals' visual memory skills (r = .41, p < .01), RAN skills (r = -.39, p < .05) and morphological skill (r = .33, p < .05). All four reading and spelling tasks were significantly correlated with each other and with reading comprehension (all rs > .43, p < .01).

Table 2.5. Correlations of English word reading and spelling and cognitive-linguistic measures in both English and Mandarin for the bilingual group after controlling for age and non-verbal IQ.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. Visual memory skills	-														
2. Phonological skills	.23	-													
3. Working memory skills	**.48****	.30	-												
4. RAN skills	-.31	**-.47****	-.31	-											
5. Orthographic skill	.03	**.41****	-.30	-.23	-										
6. Morphological skill	.24	.18	.19	**-.42****	.06	-									
7. Mandarin Phonological skills	**.33***	**.58****	.07	**-.44****	**.37***	.31	-								
8. Mandarin Orthographic skill	.08	**.32***	-.03	-.32	**.44****	.14	**.36***	-							
9. Mandarin morphological skill	.17	**.53****	-.01	**-.32***	.15	**.34***	**.70****	.27	-						
10. Mandarin reading	-.20	.09	-.06	-.25	-.08	.26	.24	.20	**.40***	-					
11. Real-word reading	**.39***	**.39***	**.35***	**-.44****	.28	.30	.25	**.37***	.23	-.01	-				
12. Nonword reading	**.37***	**.55****	.18	**-.50****	**.46****	**.44****	**.66****	**.45****	**.50****	.06	**.46****	-			
13. Real-word spelling	**.46****	**.64****	.31	**-.55****	**.36***	**.39***	**.66****	**.38***	**.54****	.08	**.62****	**.72****	-		
14.Nonword spelling	**.52****	**.59****	**.36***	**-.45****	.30	.23	**.53****	**.43****	**.37***	.17	**.43****	**.49****	**.63****	-	
15. Comprehension	**.41***	.23	.26	**-.39***	.27	**.33***	**.31***	**.52****	.10	.02	**.45****	**.55****	**.43****	**.46****	-

Note: *p < .05. **p < .01. ***p < .001.

Correlational Findings Among Chinese and English Measures

Examination of the Mandarin variables reveals that only Mandarin morphological skill significantly correlated with Mandarin word reading ability (r = .40, p < .05; see Table 2.5). Phonological skills in English and Mandarin were significantly associated (r = .58, p < .01). There was a significant correlation between the English morphological skill and the Mandarin morphological skill (r = .34, p < .05). The Orthographic Choice tasks in two languages were also significantly associated with each other (r = .44, p < .01). These results were in line with our hypothesis that there are possible cross-linguistic transfer effects.

When participants were required to read or spell English words, their morphological skill, phonological skills and orthographic skill in Mandarin were significantly associated with pseudoword reading and both spelling abilities but not real word reading (all rs > .36, p < .05). Mandarin orthographic skill was the only Mandarin task that was significantly correlated with English real word reading ($r = .37$, $p < .05$). It was surprising that Mandarin phonological skills and orthographic skill were significantly related to English reading comprehension (phonological skills: $r = .31$, $p < .05$; orthographic skill: $r = .52$, $p < .01$). However, Mandarin word reading ability was not significantly correlated with any English reading or spelling tasks, which is inconsistent with the findings from previous literature that individuals could transfer their reading and spelling abilities of the first language when they learn to read and spell in English (e.g., Deacon, Wade-Woolley & Kirby, 2007; Wang, Cheng & Chen, 2006).

Summary of correlation analyses

The above correlation analyses showed that no significant correlations were detected between monolingual adults' cognitive-linguistic skills and real word-related literacy skills. monolinguals and bilingual adults appeared different patterns when they were required to read and spell pseudowords. In addition, potential language transfers of Mandarin to English literacy skills among Mandarin-English bilingual adults were captured.

Predictors of English reading and spelling

In order to examine the contribution of each cognitive-linguistic skill to English word reading and spelling, hierarchical regression analyses were conducted. However, because the total sample size in this study was considered to be too small (<100) to detect a moderating effect of group (Yeong et al., 2016; see also Aiken, West & Reno, 1991), it is more appropriate to conduct regression analyses separate by language background group.

Other studies have investigated group differences in a similar manner (e.g., Geva & Zadeh, 2006; Jongejan, Verhoeven & Siegel, 2007; McBride-Chang et al., 2004).

Reading and spelling abilities were entered separately as the Dependent variables and the Cognitive-linguistic measures as the Independent variables was applied. The sample sizes of both groups were relatively small, so it was considered inappropriate to include all variables in the same analysis. For the following regression analyses, therefore, nonverbal reasoning and age were controlled, which were entered in Step 1, to examine the unique contribution of cognitive-linguistic skills over for English reading and spelling abilities. Then phonological skills were entered in Step 2 because it is best established as a strong correlate of reading across orthographies (e.g., Chung & Ho, 2010; Ho, Law & Ng, 2000). Visual and orthographic skills were third and fourth since they have been shown to be strongly related to English reading and spelling more recently (e.g., Yeong, Fletcher & Bayliss, 2017; Shu, et al., 2006). In addition, these skills are also important for English reading and spelling in bilingual learners (for French-English: Comeau et al., 1999; for Chinese-English: Cheung et al., 2010). Morphological skill was entered in Step 5 because it has become increasingly important when individuals get older and more skilled in literacy skills (Roman et al., 2009; Nagy, Berninger & Abbott, 2006). RAN was included as the sixth cognitive correlate because it is a powerful correlate of reading ability and a strong predictor of both concurrent and future reading and spelling development in Chinese and English (e.g., Landerl et al., 2019; Georgiou, Parrila & Kirby, 2006). Working memory was the final step since it is an essential component of executive functioning related to later reading performance for more experienced readers (Pham & Hasson, 2014; Swanson & O'Connor, 2009) and more advanced literacy skills such as reading comprehension (Peng et al., 2018; Savage et al., 2007). For all regression, the multicollinearity was checked and the degree of collinearity was found to be acceptable (tolerance > 0.46, variance inflation factor < 2.16).

Predicting word reading

Predictors of the two dependent variables (real word reading and pseudoword reading) for both groups were analysed separately. The left of Table 2.6 and Table 2.7 report the results for real word reading and those for pseudoword are on the right.

Table 2.6. Hierarchical regression analyses predicting real word and pseudoword reading from cognitive-linguistic skills for monolingual group.

Model	Predictor	Real word reading					Nonword reading				
		B[a]	SE B[b]	β[c]	t	ΔR^2	B[a]	SE B[b]	β[c]	t	ΔR^2
1	Age	.04	.03	.34	1.79	.15	.20	.03	.17	.84	.08
	Nonverbal IQ	.01	.02	.11	.58		.20	.20	.20	.33	
2	Phonological skills	.35	.24	.27	1.47	.07	.74	.21	.57	3.52	**.32****
3	Visual memory skills	.07	.27	.06	.28	.00	-.01	.23	-.01	-.03	.00
4	Orthographic skill	.12	.21	.12	.58	.01	.15	.19	.15	.80	.02
5	Morphological skill	.20	.14	.30	1.48	.08	.14	.12	.21	1.14	.04
6	RAN	-.13	.08	-.29	-1.57	.08	-.14	.07	-.31	-1.96	.09
7	Working memory skills	-.33	.25	-.28	-1.31	.05	-.62	.17	-.54	-3.60	**.19****

Note: [a]Unstandardized beta values [b]Standard error of the unstandardized coefficients [c]Standardized beta values, R^2=the proportion of data explained by the model, *p<.05,**p<.01, *** p<.0001

Real Word Reading ability

For the English monolingual group, after age and nonverbal IQ were controlled, none of the cognitive-linguistic skills in the current study was a significant predictor of real word reading (see Table 2.6).

However, for the Mandarin-English bilingual group, phonological skills accounted for an additional 32% of the variance, F (1, 34) = 5.92, p = .020, over and above age and nonverbal IQ, in real word reading (β = .39). Orthographic skills also accounted for 15% of the variance in real word reading scores, F (1, 32) = 8.00, p = .008, β = .47. Visual memory accounted for additional 9% of the variance, F(1, 33) = 4.09, p = .051 and morphological awareness contributed an additional 5.5% of the variance, F(1, 31) = 3.19, p = .084;

however, these were only marginally significant (β = .32 and β = .41 respectively). In contrast, RAN skills, F (1, 30) = 2.74, p = .108, and working memory, F (1, 29) = 2.50, p = .124, did not explain any unique variance in real word reading for the bilinguals (for RAN: β = -.24; for working memory: β = .25). These findings were partially met our hypotheses because phonological skills and RAN skills were expected to be the significant predictors for the monolingual group and visual-orthographic skills were the significant predictors for the bilingual group.

Table 2.7. Hierarchical regression analyses predicting real word and pseudoword reading from cognitive-linguistic skills for bilingual group.

Model	Predictor	Real word reading					Nonword reading				
		B[a]	SE B[b]	β[c]	t	ΔR^2	B[a]	SE B[b]	β[c]	t	ΔR^2
1	Age	-.04	.05	-.12	-.70	.02	-.03	.05	-.10	-.58	.04
	Nonverbal IQ	-.02	.02	-.13	-.74		.17	.17	.17	.98	
2	Phonological skills	.44	.18	.39	2.43	**.15***	.63	.16	.56	3.87	**.29*****
3	Visual memory skills	.42	.21	.32	2.02	.09	.33	.19	.25	1.78	.06
4	Orthographic skill	.47	.17	.47	2.83	**.15****	.30	.16	.30	1.85	.06
5	Morphological skill	.13	.08	.26	1.79	.06	.16	.07	.31	2.27	**.08***
6	RAN	-.10	.06	-.24	-1.66	.05	-.11	.05	-.27	-2.06	**.06***
7	Working memory skills	.30	.19	.25	1.58	.04	-.18	.18	-.15	-.99	.01

*Not*e. [a]Unstandardized beta values [b]Standard error of the unstandardized coefficients [c]Standardized beta values, R^2=the proportion of data explained by the model, *p<.05,**p<.01, *** p<.0001

Pseudoword Reading ability

When pseudoword reading ability was the outcome measure, phonological awareness explained a significant portion of the variance, F(1, 23) = 12.35, p = .002, β = .57, accounting for 32.2% of the variance. Working memory was also observed to be a significant predictor, an additional 19% of the variance in pseudoword reading was explained by this measure, F(1, 18) = 12.99, p = .002, β = -.54. In addition, RAN skills contributed marginally, explained an additional 9% of the variance, to English adults' pseudoword reading ability, F(1, 19) = 3.87, p = .064, β = -.31.

For the bilingual group, as shown in Table 2.7 their cognitive-linguistic skills uniquely explained variance in phonological awareness, morphological awareness and RAN skills were significant predictors of their pseudoword reading skill. Phonological awareness contributed an additional 29% of the variance, $F(1, 34) = 14.95$, $p = .000$, $\beta = .56$, morphological awareness and RAN skills contributed for 8%, $F(1, 31) = 5.17$, $p = .030$, $\beta = .31$, and 6% of the unique variance, $F(1, 30) = 4.26$, $p = .048$, $\beta = -.27$ respectively. In addition, visual memory skills and orthographic skill were only marginally ($p = .085$ and $p = .073$ respectively) and would explain an additional 6% and 6% of the variance for these two skills in pseudoword reading ability: visual memory: $F(1, 33) = 3.16$, $\beta = .25$; orthographic skill: $F(1, 32) = 3.43$, $\beta = .30$.

The results of regression analyses for pseudoword reading of the monolingual group met our hypotheses as phonological awareness was the strongest predictor. The results of the bilingual group only partially met the hypotheses that phonological awareness and visual-orthographic would be the significant predictors for pseudoword reading tasks; however, the results indicated that visual-orthographic skills were only marginally significant predictors.

Real Word Spelling ability

The regression analyses of real word spelling ability of the monolingual group showed a similar pattern as real word reading ability. As indicated in Table 2.8, none of the predictor variables contributed significantly to real word spelling: phonological: $F(1, 23) = .001$, $p = .974$, $\beta = .01$; visual memory: $F(1, 22) = .03$, $p = .864$, $\beta = -.04$; orthographic: $F(1, 21) = 1.01$, $p = .328$, $\beta = .22$; morphological: $F(1, 20) = .01$, $p = .948$, $\beta = .01$; RAN: $F(1, 19) = .14$, $p = .709$, $\beta = -.08$; working memory: $F(1, 18) = .02$, $p = .898$, $\beta = .03$.

Table 2.8. Hierarchical regression analyses predicting real word and pseudoword spelling from cognitive-linguistic skills for monolingual group.

Model	Predictor	Real word spelling					Nonword spelling				
		B[a]	SE B[b]	β[c]	t	ΔR^2	B[a]	SE B[b]	β[c]	t	ΔR^2
1	Age	.05	.03	.36	1.89	.16	.03	.03	.20	1.03	.10
	Nonverbal IQ	.01	.02	.12	.63		.20	.20	.20	1.02	
2	Phonological skills	.01	.25	.01	.03	.00	.69	.22	.53	3.19	**.28****
3	Visual memory skills	-.05	.28	-.04	-.17	.00	.16	.24	.14	.67	.01
4	Orthographic skill	.22	.22	.22	1.00	.04	.49	.16	.48	3.03	**.19****
5	Morphological skill	.01	.15	.01	.07	.01	.05	.11	.07	.45	.00
6	RAN	-.04	.09	-.08	-.38	.01	-.11	.06	-.25	-1.77	.06
7	Working memory skills	.04	.30	.03	.13	.01	-.37	.18	-.32	-2.04	.07

Note. [a]Unstandardized beta values [b]Standard error of the unstandardized coefficients [c]Standardized beta values, R^2=the proportion of data explained by the model, *p<.05,**p<.01, *** p<.0001

Within the bilingual group, phonological awareness, visual and RAN skills were observed to be the significant predictors for their real word spelling. As indicated in Table 2.8, phonological awareness was the strongest predictor, accounting for 41% of the variance, F(1, 34) = 23.61, p = .000, β = .66, to real word spelling. Except for phonological awareness, visual memory and RAN skills were also significant predictors, accounted for 10% and 7% of the variance respectively, to English real word spelling for Mandarin-English adults: visual memory: F(1, 33) = 6.96, p = .01, β = .34; RAN: F(1, 30) = 6.14, p = .02, β = -.31.

Pseudoword Spelling ability

Phonological awareness explained a significant amount of the variance (30%), in English monolingual adults' pseudoword spelling, F(1, 23) = 10.19, p = .004, β = .53. Orthographic skill also contributed an additional 19% of the variance to their pseudoword spelling ability: F(1, 21) = 9.19, p = .006, β = .48. RAN and working memory skills only marginally predicted 6% and 7% of the variance in pseudoword spelling: RAN: F(1, 19) = 3.13, p = .093, β = -.25; working memory: F(1, 18) = 4.17, p = .056, β = -.32. As expected,

phonological awareness was again found to be the strongest predictor in monolingual adults' pseudoword spelling ability.

Table 2.9. Hierarchical regression analyses predicting real word and pseudoword spelling from cognitive-linguistic skills for bilingual group.

Model	Predictor	Real word spelling					Nonword spelling				
		B[a]	SE B[b]	β[c]	t	ΔR^2	B[a]	SE B[b]	β[c]	t	ΔR^2
1	Age	.01	.05	.04	.26	.01	-.04	.05	-.12	-.71	.03
	Nonverbal IQ	.01	.02	.09	.50		.10	.17	.10	.58	
2	Phonological skills	.74	.15	.66	4.86	**.41*** **	.68	.16	.60	4.27	**.34*** **
3	Visual memory skills	.44	.17	.34	2.64	**.10****	.53	.17	.40	3.16	**.15****
4	Orthographic skill	.20	.15	.20	1.39	.03	.30	.14	.30	2.09	**.06***
5	Morphological skill	.10	.10	.19	1.45	.03	.04	.07	.08	.59	.01
6	RAN	-.13	.05	-.31	-2.48	.07	-.09	.05	-.21	-1.61	.03
7	Working memory skills	-.07	.17	-.06	-.40	.00	.10	.18	.08	.51	.00

Note. [a]Unstandardized beta values [b]Standard error of the unstandardized coefficients [c]Standardized beta values, R^2=the proportion of data explained by the model, *p<.05,**p<.01, *** p<.0001

For the bilingual adults, as shown in Table 2.9, phonological awareness accounted for 34% of the unique variance, F(1, 34) = 4.17, p = .056, β = -.32, visual memory skills accounted for 15% of the unique variance, F(1, 33) = 9.99, p = .003, β = .40, and orthographic skill contributed 6%, F(1, 32) = 4.38, p = .044, β = .30 to pseudoword spelling ability. While English morphological awareness, working memory and RAN skills did not explain the unique variance in this measure.

Our hypothesis that phonological skills would be a significant predictor of English spelling ability for both groups was only partially supported because this was not found for the real word spelling ability of the monolingual group. In addition, in our hypothesis, visual-orthographic skills were expected to be the strongest predictor for the bilingual group, which was not met by the results of the regression analyses. These results suggest that

even different skills may be applied to reading and spelling activities depending on language background, but phonological awareness was the strongest predictor.

Reading Comprehension ability

For monolingual adults, their cognitive-linguistic skills failed to explain the unique variance in English reading comprehension (see Table 2.10). In contrast, visual memory skills and morphological skills of the bilingual group appeared to the significant predictors of reading comprehension skill. That is, visual memory skills accounted for 18% of the variance, F(1, 33) = 7.88, p = .008, β = .11, and morphological awareness explained 11% of the variance in English reading comprehension. When we added three Mandarin variables into the model, only Mandarin morphological awareness was a marginally significant predictor of English reading comprehension skill, (β=.41; ΔR^2=.07, p =.063).

Table 2.10. Hierarchical regression analyses predicting English reading comprehension for the monolingual and bilingual groups.

Model	Predictor	Monolinguals					Bilinguals				
		B[a]	SE B[b]	β[c]	t	ΔR^2	B[a]	SE B[b]	β[c]	t	ΔR^2
1	Age	-.05	.04	-.27	-1.55	.33	.03	.03	.18	1.07	.03
	Nonverbal IQ	.07	.02	.55	3.19		.00	.03	.01	.03	
2	Phonological skills	.04	.23	.03	.18	.01	.27	.19	.23	1.37	.05
3	Visual memory skills	.07	.25	.06	.27	.00	.59	.21	.45	2.81	**.18****
4	Orthographic skill	-.22	.20	-.22	-1.10	.04	.10	.19	.10	.55	.01
5	Morphological skill	.05	.13	.08	.40	.01	.20	.09	.39	2.31	**.11***
6	RAN	-.25	.21	-.23	-1.19	.05	-.16	.22	-.13	-.72	.01
7	Working memory skills	.36	.25	.31	1.44	.06	-.07	.23	-.06	-.32	.00

Note. [a]Unstandardized beta values [b]Standard error of the unstandardized coefficients [c]Standardized beta values, R^2=the proportion of data explained by the model, *p<.05,**p<.01, *** p<.0001

Cross-language transfer effect

As mentioned in the correlation analyses, phonological, orthographic and morphological skills in English were significantly correlated to those skills in Mandarin. In order to examine the cross-language transfer effects of these skills from Mandarin to English, a final series of hierarchical regression analyses were conducted. For predicting English reading and spelling abilities, age and IQ were entered in the first block. The English cognitive-linguistic tasks were entered next as control variables. Following, the composite scores of phonological, orthographic and morphological skills were entered one at a time.

From Table 2.11, English real word reading was significantly explained by Mandarin phonological awareness, accounting for 8% of the unique variance, F(1, 33) = 6.10, p = .044 β = .11. Similarly, among three Mandarin cognitive-linguistic variables, Mandarin phonological skills were the only significant predictors of English real word spelling and explained an additional 8% of the variance, F(1, 33) = 6.26, p = .018 β = .38.

Table 2.11. Hierarchical regression analyses predicting English real word measures from Mandarin cognitive-linguistic skills for bilingual group.

Model	Predictor	Real word reading					Real word spelling				
		B[a]	SE B[b]	β[c]	t	ΔR^2	B[a]	SE B[b]	β[c]	t	ΔR^2
1	Age	-.04	.05	-.12	-.71	.02	.01	.05	.04	.26	.01
	Nonverbal IQ	-.02	.02	-.13	-.76		.01	.02	.09	.52	
2	Phonological skills	.44	.18	.39	2.50	**.15****	.74	.15	.66	5.00	**.41*****
3	Orthographic skill	.50	.17	.50	2.95	**.17****	.23	.15	.23	1.52	.04
4	Morphological skill	.16	.07	.31	2.18	**.08***	.13	.07	.25	1.89	.05
5	RAN	-.22	.19	-.18	-1.14	**.07***	-.28	.17	-.24	-1.63	.04
6	Working memory skills	.39	.17	.32	2.34	.02	.13	.16	.11	.80	.01
7	Mandarin phonological skills	-.11	.14	.11	.75	**.08***	.47	.19	.38	2.47	**.07***
8	Mandarin orthographic skill	.10	.16	.10	.59	.01	-.02	.15	-.02	-.12	.00
9	Mandarin morphological skill	.07	.18	.07	.36	.00	.13	.19	.13	.67	.01

Note. [a]Unstandardized beta values [b]Standard error of the unstandardized coefficients [c]Standardized beta values, R^2=the proportion of data explained by the model, *p<.05,**p<.01, *** p<.0001

In addition, as shown in Table 2.12, both Mandarin phonological and orthographic skills predicted significant amount of unique variance for English pseudoword reading and spelling skills. Specifically, phonological awareness explained an additional 8% of the variance, $F(1, 31) = 6.57$, $p = .015$, $\beta = .40$, and orthographic skill accounted for 4% of the variance, $F(1, 30) = 3.49$, $p = .042$, $\beta = .26$, in pseudoword reading abilities. Moreover, phonological awareness contributed 10% of the unique variance, $F(1, 31) = 7.85$, $p = .009$ $\beta = .46$, and orthographic skill contributed for 6%, $F(1, 30) = 5.37$, $p = .028$ $\beta = .32$, to pseudoword spelling abilities.

From the cross-language analyses, Mandarin phonological awareness and orthographic skills were transferred to English pseudoword reading and spelling skills, but only Mandarin phonological awareness was transferred to English real word literacy skills. We could, therefore, confirm that there are transfer effects is from bilingual adults' first language to the second language.

Table 2.12. Hierarchical regression analyses predicting English pseudoword measures from Mandarin cognitive-linguistic skills for bilingual group.

Model	Predictor	Nonword reading					Nonword spelling				
		B	SE B	β	t	ΔR^2	B	SE B	β	t	ΔR^2
1	Age	-.03	.05	-.10	-.60	.04	-.04	.05	-.12	-.71	.03
	Nonverbal IQ	.02	.02	.17	1.01		.01	.02	.01	.58	
2	Phonological skills	.63	.16	.56	3.98	**.29*** **	.68	.16	.60	4.27	**.34*** **
3	Orthographic skill	.32	.16	.32	2.00	.07	.33	.16	.43	2.77	**.07***
4	Morphological skill	.18	.07	.35	2.64	**.10***	.08	.07	.16	1.09	.02
5	RAN	-.20	.18	-.16	-1.09	.02	-.17	.19	-.14	-.87	.01
6	Working memory skills	-.02	.17	-.01	-.09	.00	.30	.17	.25	1.76	.05
7	Mandarin phonological skills	.50	.19	.40	2.56	**.08***	.46	.16	.46	2.80	**.10****
8	Mandarin orthographic skill	.26	.14	.26	1.87	**.04***	.32	.14	.32	2.32	**.06***
9	Mandarin morphological skill	-.01	.18	-.01	-.05	.00	-.26	.17	-.26	-1.53	.03

Note. [a]Unstandardized beta values [b]Standard error of the unstandardized coefficients [c]Standardized beta values, R^2=the proportion of data explained by the model, *p<.05,**p<.01, *** p<.0001

2.5 Discussion

Empirical research has demonstrated that the first language acquisition experience could significantly shape the way children learn a second language (French-English: Commissaire, Duncan & Casalis, 2011; Spanish-English: Sun-Alperin & Wang, 2011; Korean- English: Kang, 2012; Chinese-English: Tong & McBride-Chang, 2010). However, little is known about whether these findings could be generalised to adult English language learners. In the current study, therefore, different English cognitive-linguistic skills of Chinese adults and English monolingual adults were assessed to examine if they use similar strategies when they read and spell in English. In addition, we also evaluated the contributions of these skills to English reading and spelling abilities for both groups. Some main findings of the within- and cross-language analyses are noteworthy.

Group differences in cognitive-linguistic skills

Taken into account research findings, the hypotheses that the performance of Mandarin ESL adults on the English-related tasks would be poorer than that of English monolingual adults were proposed. As expected, Mandarin-L1 adults had significantly poorer performance on both English phonological tasks and all English reading and spelling tasks, compared to their English monolingual peers. These results are consistent with previous research showing that Mandarin-L1 children and adults have been shown significantly poorer phonological awareness compared to English monolingual children (Yeong & Liow 2012; Cheung et al., 2001) and adults (Yeong, Fletcher & Bayliss, 2016). The weakness that Mandarin-L1 adults experience on phonological awareness is very limited because of the nature of Chinese language, which has a simpler phonological structure and a more complex logographic script than English. These characteristics encourage word-specific knowledge and promote a lexical approach to the writing system, but not the understanding of sound units in the language in the Chinese acquisition process (McBride-Chang & Chen, 2003). In addition, the poorer performance on morphological, reading, spelling and reading comprehension tasks in English indicated that the Mandarin-L1 adults' English level is not as proficient as the English monolinguals in the current study. Hakuta et

al. (2000) suggested that ESL learners could catch up with the English proficiency of their monolingual peers when given an extended window of opportunity, sometimes as long as 10 years. As the Mandarin-L1 adults in the current study have only lived in an English-speaking country only for a short period of time (less than three years), it is plausible that a relatively shorter length of extensive exposure to English environment limited their English language ability (for a review, see August & Shanahan, 2006; Dussias & Sagarra, 2007).

However, Mandrin-L1 adults outperformed English monolinguals on two visual memory tasks but not on design memory suggested that Mandarin-L1 are better at processing abstract visual information (Arabic and Tamil scripts) but not at processing familiar elements (e.g., circles, dots, lines) than the English native speakers. The plausible explanation is, compared to English, the acquisition of Chinese requires stronger visual skills to deal with more complex visual information to memorise Chinese characters (McBride-Chang, 2015), which is supported by a considerable amount of research has found that bilingual learners whose first language is Chinese developed stronger visual memory than those from alphabetic L1 backgrounds (Caravolas, Hulme & Snowling, 2001; Holm & Dodd, 1996).

Between the two groups, however, there was no significant difference on the orthographic choice task. Even previous studies have suggested that Chinese-L1 children may have better orthographic skills than English monolingual children (Wang & Geva, 2003); however, Roman and his colleague found that older children (age 9 years) shifted to using orthographic skills but not phonological skills when reading and spelling English words (Roman et al., 2009). With exposure to English over time, English monolinguals are able to develop sufficient orthographic skills to build whole sight word recognition skills and understand the pattern of English orthography to develop sufficient levels of English word reading and spelling skills (see Ehri, 2005). Therefore, we were not surprised that adults

from the two completely different language groups demonstrated similar proficiencies in orthographic skills.

Another main finding is that, for English reading and spelling skills, the English monolingual and Mandarin-L1 adults rely on different cognitive-linguistic skills. With regard to the processes underlying reading and spelling, an unexpected finding was that the phonological processing skills were significantly correlated to reading and spelling abilities of Mandarin-L1 adults. Although their phonological skills were significantly lower than their English peers, the bilingual group was still able to use the skills to complete word reading and spelling tasks even in adulthood. These findings are similar to studies conducted with Chinese-L1 children, which indicated that English phonological awareness was the strongest predictor of English word reading (McBride-Chang & Kail, 2002). Gottardo et al. (2001) also showed that Cantonese-L1 children's phonological awareness in both Cantonese and English contributed unique variance to their English reading accuracy. A recent study also found that phonological awareness, but not orthographic skill, was the significant predictor for the English reading ability of Chinese-English bilingual adults (Yeong et al., 2017). Our results indicated phonological awareness was strongly correlated to the literacy skills of Mandarin-L1 adults, which suggests that bilingual adults also rely on decoding strategies through grapheme-phoneme correspondences. Chen et al. (2010) compared the phonological awareness skill of children in a regular English class with those who received intensive training, they found that extra English phonological instruction could help Mandarin-L1 children significantly improve their English phonological awareness. A similar finding was reported by Yeong and Liow (2012). In their study, Mandarin-L1 children after receiving English instruction in kindergarten for one year, the instruction effect was maintained on their English phoneme awareness, indicated by continually improved phoneme awareness. Because the Mandarin-L1 adults in the current study came to an English-speaking environment to receive English-taught course at tertiary level, the English immersion environment may have allowed them to pick up some phonological processing skills with continued exposure to the alphabetic language through

the years. This result indicated that Mandarin-English adults were still able to acquire new language skills, which is essential for L2 development (Wang & Geva, 2003).

Cognitive-linguistic skills predicting English word reading and spelling in the monolingual adult group

Phonological awareness

The current results indicated different skills were applied when monolingual and Mandarin-L1 adults were required to read and spell real words and pseudowords within each group. Yeong et al. (2017) conducted a similar study to examine the effect of phonological awareness and orthographic knowledge on English reading and spelling abilities of English monolingual and Chinese-L1 adults. They found that neither phonological nor orthographic processing predicted unique variance for word reading and spelling abilities of English monolingual adults. However, Yeong and her colleague only examined real word reading and spelling abilities. In the current study, not only real word reading and spelling abilities were assessed but also pseudoword tasks. However, only the results of real word reading and spelling tasks of monolingual adults were consistent with their findings that none of the cognitive-linguistic skills was a significant predictor of English literacy skills, which did not meet the hypothesis of the current study. As exemplified by Caravolas and his colleagues (2003), phonological awareness in Kindergarten was not predictive of reading and spelling in Year 3. However, when measured in Year 1, it became a significant predictor. It is, therefore, possible that phonological awareness only plays an important role in the English acquisition process for a limited period of time, especially in early English learning process. Skilled readers and spellers have extensive reading and spelling experience; hence, they rely more on the automatic memory retrieval process rather than activation of phonological awareness for real words related tasks (Ehri, 1992). In terms of pseudoword reading and spelling activities, phonological awareness was found to be the strongest predictor, although previous studies have demonstrated adults would rely less on phonological skills on reading and spelling tasks (Thompkins & Binder, 2003; Dietrich & Brandy, 2001). These

results indicate that the monolingual adults would like to employ phonological processing skills when they encounter unfamiliar words, which support Hulme and his colleague conclusion that phonological awareness to be the strongest predictor of word reading and spelling abilities, in both skilled and poor readers (Hulme et al., 2012). In addition, the present results also support the self-teaching hypothesis that phonological awareness serves as the primary way in successful novice word decoding in English (Morais et al., 1987; Share, 2008). Therefore, compared to real word reading and spelling, phonological awareness is a more powerful predictor of pseudowords reading and spelling accuracy, especially for skilled readers and spellers (Swanson, 2003; Stappen & Teybroeck, 2018).

Orthographic processing skill

High-quality orthographic representations are crucial for spelling because they allow the immediate activation of the phonological form of the word in long-term memory (e.g., Cunningham et al., 2001; Deacon, 2012). Not surprisingly, orthographic processing skill was important for the pseudoword spelling ability of English monolingual adults in the current study. Spelling in English is known to be more difficult than reading because there are more ways to spell a given word than to read it (i.e., phoneme-to-grapheme correspondences are more ambiguous than grapheme-to-phoneme correspondences; Fletcher-Flinn et al., 2004). In order to achieve efficient spelling, it may be necessary to employ both whole-word strategies and sublexical attributes of the English writing system in addition to applying phoneme-grapheme correspondences to manage the inconsistency of English orthography for the English monolingual adults. Previous studies indicated that there are age-related changes from reliance on phonological spelling strategies to greater reliance on orthographic strategies from children to adults (Perfetti, 1997; Greenberg et al., 2002), which is inconsistent with the results of the current study. We found that even both phonological awareness and orthographic processing skills were significant predictors of pseudoword-related tasks, phonological awareness was still the strongest predictor. A possible reason for divergent results is the pseudoword spelling task used, which has fewer orthographic presentations compared to regular and irregular words. Therefore,

even both skills were significant predictors of English pseudoword spelling, the monolingual adults were dependent more on phonological awareness than orthographic knowledge.

Visual memory skills

The impetus for the present study was that visual memory skills were not a significant predictor of the literacy skills of adults, as indicated by Holmes (2012). The current results were consistent with this claim. For monolingual adults, visual memory skills did not even significantly correlate with their literacy skills irrespective of real words or pseudowords tasks. The results met the hypotheses that, for normally developed readers, visual memory skills play a minimal role in their word recognition strategy as visual memory is not a sufficient skill for the English acquisition process. More supportive evidence is from research focused on poor readers and spellers. Previous studies reported that adults with dyslexia have difficulty in reproducing the correct order of unfamiliar symbols simultaneously (Goulandris & Snowling, 1991) and sequentially (Romani et al., 1999) compared to the controls. The visual memory problem underlies reading and spelling impairment in dyslexics. The participants in the current study did not report any reading or spelling problems. Therefore, their performance in processing the order of elements in visual arrays did not contribute to the efficiency of reading and spelling.

Working memory skills

Other than phonological awareness and orthographic skills, the current study also found working memory skills, which mainly assess temporal encoding ability, made significant contributions to pseudoword reading and spelling ability. Reading and spelling pseudowords require the activation of phonological representations stored in long-term memory and temporarily maintain the ordered sequence of phonological information during the application of grapheme-phoneme conversion rules in reading and phoneme-grapheme conversion rules in spelling to encode the unfamiliar sequence of letters

(Romani et al., 2015; Biname & Poncelet, 2016). In order to successfully process novice words, skilled readers and spellers need to rapidly store information and activate relevant phonological structures from their long-term memory, which explains the significant relationships with pseudoword reading and spelling abilities. The results of the current study indicated that working memory remains a reliable predictor of pseudoword reading and spelling, which is consistent with previous studies with children samples (Melby-Lervag & Hulme, 2010; McIntyre, 2015; Peng et al., 2018) and adult samples (Majerus et al., 2006; Romani et al., 2015). In addition, reading and spelling tasks were specifically included real words and pseudowords because real word tasks require the activation of the direct lexical procedure to retrieve the word from the orthographic lexicon but pseudoword tasks do not. No significant correlation was found between working memory and real word reading and spelling abilities, suggesting that working memory does not directly contribute to reading and spelling when orthographic representations allow the use of a direct retrieval strategy to read or spell real words. These results are in accordance with the suggestion of that working memory is no longer involved in the reading or spelling of words that already have a long-term orthographic representation, as there is no need to draw on letter-sound mappings in this case. The findings are in line with the dual-process theory that working memory, as a high-level cognitive resource, is involved in processing novel information (Evans & Stanovich, 2013).

Nevertheless, the possibility that working memory may be involved in the reading and spelling of known words by the lexical route cannot be ruled out as empirical evidence suggested working memory also accounted for literacy skills, such as real word reading and spelling in adults (Jaeggi et al., 2008; Alloway & Gregory, 2013). According to Baddeley's multi-component model, verbal and visuospatial domains constitute the construct of working memory and each domain could influence individuals' language skills differently (Jarvis & Gathercole, 2003). Some studies report that older adults compared to younger adults are more impaired in tasks requiring temporary storage and active manipulation of visuospatial as opposed to verbal information (Jenkins et al., 2000; Vecchi & Cornoldi, 1999). In contrast, other studies have shown a more important age-related

decline for verbal as opposed to visuospatial material (Fastenau et al., 1996; Vecchi et al., 2005). In addition, recent studies also point out that the verbal domain exerts more influence than the visuospatial domain on English reading skills (Oakhill et al., 2011; Peng et al., 2018), whereas other studies indicated that both verbal and visuospatial working memory could significantly predict reading and spelling (Swanson, 1999; Swanson & Howell, 2011). However, in the current study, only verbal working memory was assessed, which might be the reason that no significant relationship was found between working memory skills and monolinguals' reading and spelling abilities. Further research is needed to investigate the relationship between distinct components of working memory and literacy skills of adults to reach clearer conclusions about specific theoretical frameworks of working memory.

RAN skills

In recent studies, more researchers argue that rapid naming may play a more prominent role than phonological awareness in explaining and predicting individual differences in English literacy skills (e.g., Wimmer et al., 2000; Georgiou et al., 2014). Strangely, RAN skills were marginally contributed to pseudoword reading only. RAN was hypothesised to be a stronger predictor of real word reading and spelling than of pseudoword reading and spelling as orthographic processes are of relatively low relevance in pseudoword reading and spelling (Manis et al., 1999; Wolf & Bowers, 1999). However, existing evidence showed that the relationship between RAN and reading appears to become weaker in older samples of children (e.g., de Jong & van der Leij, 2002; Kirby et al., 2003; Parrila et al., 2004). Moreover, several reports from English-speaking countries suggest that RAN diminish as a predictor of reading after the first grades in school (e.g., Powell et al., 2007, Meyer et al., 1998). As the participants in the current study were all skilled readers, it is not surprised that no significant relationship was found between RAN skills and real word reading ability. In addition, Manis et al. (1999) emphasized the role of RAN would be more important to literacy tasks if the tasks involve more arbitrary orthography-to-phonology

mappings, as in exception and novice words versus regular words tasks. It is, therefore, possible that RAN skills significantly contributed to pseudoword reading.

As for spelling abilities, even a significant correlation was found between RAN skills and pseudoword spelling ability, no significant causual relationship was found between RAN skills and spelling ability. The results accord with the findings of Georgiou et al. (2016) and Wolff (2014). These findings are further supported by the study of Stappen and Reybroeck (2018) that, after conducting a RAN intervention study, only word reading speed but not word reading and spelling accuracy was enhanced. Although some studies pointed out that RAN skills substantially predicted English word spelling ability, these studies mainly focused on younger spellers in kindergarten and Year 1 and 2 (e.g., Savage et al., 2005; Furnes & Samuelsson, 2011). It is possible that RAN skills specifically contributed to the prediction of reading rather than spelling. As only limited studies were conducted with English monolingual adults to investigate if RAN skills continue to be a significant predictor of spelling in mature adulthood, we cannot yet draw any firm conclusions about whether RAN skills play an important role in adult spelling ability.

Based on theories of reading and spelling development (e.g., Ehri, 1992; Seymour, 2006), individuals would rely more on whole-word recognition than on phonological processing as their reading and spelling skills develop. In support of this argument, Badian (2001) demonstrated that although phonological awareness predicted unique variance in reading in the early grades, orthographic knowledge was more important in later grades. Taken together, as suggested by Bowey et al. (2005), RAN is related to reading and spelling because of phonological processing and it is less important for reading in later grades, then this explains why RAN is not important for adults' reading and spelling.

However, Neuhaus et al. (2001) indicated that measuring total performance time fails to determine the nature of RAN tasks and that interest should be turned to components of

these tasks, such as articulation time, which is the sum of all correctly articulated times that correspond to the displayed RAN stimuli, and pause time, which is the sum of the length of pauses that are the intervals between the correctly sequenced articulations (Georgiou et al., 2008). The current study captured the time for completing the whole task. Further study, therefore, should continue to investigate the interrelationship among different RAN skills by recording articulation time and pause time and literacy skills. In addition, RAN skills are always assessed by two types of stimuli: alphanumeric (RAN-Letters and RAN-Digits), which refers to the rapid naming of familiar written symbols, and non-alphanumeric (RAN-Objects and RAN-Colours), the rapid naming of visual stimuli. Usually, alphanumeric RAN could be named faster than non-alphanumeric RAN (Horunung et al., 2017). Multiple studies have shown that alphanumeric RAN is a better predictor of reading skills than non-alphanumeric RAN, both in the general population and in differentiating between normal and poor readers (Cardoso-Martins & Pennington, 2004; Bowey et al., 2005; Heikkilä et al., 2009). Other studies found that non-alphanumeric RAN predicted early spelling skills (Lervåg & Hulme, 2009; Caravolas et al., 2012). However, the current study only assessed alphanumeric skills in order to control the language interference effect for the bilingual participants. For further research, the role of both alphanumeric and non-alphanumeric RAN factors should be considered in reading and spelling abilities of adults.

Morphological skill

According to the models of reading and spelling development, advanced readers and spellers prefer to use large units such as morphemes and syllables from small units such as phonemes (Ehri, 2005; Seymour et al., 2003). This is supported by evidence from other studies conducted with English monolingual children in primary school. Carlisle (2003) indicated that morphological awareness is a unique predictor of real word reading and spelling. It is noteworthy that morphological awareness was assessed in the current study, but it failed to predict monolingual adults' reading and spelling abilities, which is inconsistent with empirical evidence (Henbest et al., 2020; Fracasso et al., 2016; Wolter et

al., 2009). In addition, as indicated by Carlisle's (1995), there are three types of morphology: compound, inflection and derivation. A large number of studies focused on morphological awareness have mainly employed tasks assessing knowledge of derivational morphology and principles of affixation and suffixation to make morphologically more complex word forms (Apel et al., 2013). Although all of these three types of morphology measure morphological awareness, derived morphology is harder than inflected and compound morphology (Zhao et al., 2017). The Compound noun task was used to measure morphological awareness, but the performance of monolingual adults near the ceiling indicated that this task was relatively easy for them, which is a plausible explanation for this inconsistent result. Therefore, for further research, the morphological awareness tasks should be compatible with participants' ability and different aspects of morphological awareness (e.g., derived and inflected morphology) should be assessed to examine if morphological awareness could explain unique variance in skilled reading and spelling processes.

In conclusion, phonological awareness and working memory were found to be significant skills that assist recognition of pseudowords. The orthographic skill could predict pseudoword spelling ability and RAN skills were only marginally predicted pseudoword reading skill. However, the current study failed to detect any central role for cognitive-linguistic skills in adults' real word reading and spelling skills, which raises the question as to why previous research has been able to find the significant relationships. The potential limitations have been spotted above, which provide the directions for further research to investigate the factors that are crucial for developing and maintaining precise literacy skills. In addition, skilled reading and spelling are characterised as the ability to recognise the target words rapidly, automatically and accurately, which indicates the speed and accuracy on various tasks would both be efficient measures for skilled reading and spelling (Holmes, 2012). However, the current study was only able to capture a single performance time for word reading tasks and orthographic choice task. The reaction time for other measures were the total performance time. Further research could examine if reading and spelling fluency could provide more informative results. As little research has focused on

normally developed readers and spellers, the research conducted with experienced adult readers could provide evidence for theoretical models and theories of skilled reading and spelling.

Cognitive-linguistic skills predicting English word reading and spelling in the Mandarin-L1 adult group

Phonological awareness

For the Mandarin-L1 group, the findings were different from the monolingual group. It is surprising that phonological awareness was a significant predictor of all reading and spelling tasks. Even the phonological awareness of Mandarin-L1 adults was significantly poorer than their English peers, they still rely on such skills. The results are consistent with recent studies conducted with Mandarin-English bilingual children (Wang et al., 2005; Yeong et al., 2014). They found that the predictive role of English phonological awareness in English reading and spelling abilities was confirmed by both bilingual children and adults. Furthermore, Wang et al. (2003) suggested that Chines ESL might treat English as a completely new language system due to the distinct differences between the two language systems. When they were exposed to English, they gradually acquired some phonological skills in English, which is more effective for acquiring English, compared to simply relying on skills that were transferred from their L1 (e.g., orthographic skills). The Chinese participants in the current study demonstrated a great reliance on English phonological skills and a relatively weak reliance on orthographic skills. It might be possible that the transfer effect of orthographic skills was only involved in the beginning stages of English learning. As soon as phonological skills in English were proficient enough to help with English learning, the reliance on orthographic knowledge was decreased. The learners will adopt more efficient strategies in the language learning process.

In addition, the significant contribution of phonological awareness was unexpected but could be explained by the educational context. The participants of both Wang et al. (2005)

and Yeong et al., (2014) were Chinese– English bilinguals who receive English instruction in school and only use Chinese at home. In school, children received phonics instruction, which is a major component in early reading programs. Therefore, they are likely to use phonological and decoding strategies to read and write English. There are some studies that were inconsistent with the current study (Keung & Ho, 2009; Leong et al., 2005). In their studies, they recruited Cantonese-English bilinguals. For these children, Cantonese was the medium of instruction for the Hong Kong children. These children were exposed to English mainly in English language classes, where phonics instruction was not provided. Thus, it is plausible that the participants of these studies applied L1 strategies (i.e., whole word activation) to English reading and spelling activities, which strengthened the cross-language connection between English and Chinese word reading. As for the studies conducted with Chinese-English bilinguals, Yeong et al. (2017) found phonological skill was the strongest predictor of English reading, but orthographic processing skill was the most important factor of English spelling, which were partially consistent with the current study. However, the participants in their study were from various language backgrounds (Mainland China, Hong Kong and Singapore), which is hard to control the influence of language experience on their second language acquisition process. In the current study, we only included Mandarin-L1 participants, which may explain the inconsistent findings. As mentioned in the previous section, Mainland China introduced Pinyin to facilitate the initial learning of Mandarin. Although the phonological structure of Mandarin is simpler than English, it still enables children to develop phonological awareness. Therefore, it raises further questions as to compare whether Chinese-English bilinguals from different language backgrounds adopt different skills for English literacy acquisition.

Visual-orthographic processing skill

The results of the regression analyses suggest that visual-orthographic processing skill contributes to English spelling tasks and real word reading task for Mandarin-L1 adults, but only marginally contributes to pseudoword reading ability, which only partially supports our hypothesis. The findings of significant contributions of visual-orthographic skills are

consistent with other findings in ESL English development studies (Yeung, 2006) in which visual-orthographic skills were shown to be of particular importance not only for accessing the addressed phonology in reading but also for correct spelling among advanced ESL learners. According to the Orthographic Depth Hypothesis, as an extremely deep orthography, Chinese encourages the readers and spellers to predominantly depend on visual analytic skills in reading and spelling words (Katz & Frost, 1992). As indicated in empirical evidence, compared to Malay L1 children perceived as a shallow orthography, Malay, Mandarin L1 children preferred to utilise orthographic information rather than phonological information in English reading and spelling activities, even both orthographic and phonological skills were activated in processing the words in both groups (Liow & Lau, 2006). However, findings in some longitudinal studies demonstrated that, for more advanced Chinese ESL learners, visual-orthographic skills were of greater significance than phonological skills in predicting English reading and spelling abilities (Holm & Dodd, 1996; Leong et al., 2005).

But in the current study, although all the participants were adults, the amount of unique variance explained by phonological measures was higher than the visual-orthographic measure. The plausible explanation is that the Chinese ESL learners in the study of Leong and colleagues were in a Chinese-speaking environment; however, the ESL learners in the current study are receiving full-time education in an English-speaking environment. With more intensive exposure to English, it is possible that they have developed a speech sound to print 'self-teaching device' and the acquisition of individual word representations as discussed by Share (1995). Therefore, even they still rely on both phonological and visual-orthographic skills when reading and spelling English words, they gradually start to adopt a more optimal linguistic skill for English rather than purely rely on the skills that are optimal for their first language. From this aspect, these learners have got benefits from the English immersion.

In addition, Holm and Dodd (1996) also found that the Chinese-L1 students mainly relied on orthographic information when they needed to process real words and pseudowords in English. It is noteworthy that the phonological code of Mandarin Chinese, Pinyin, was introduced since 1990. However, the subjects in the study of Holm and Dodd were already university students in 1996. That is, they had not been exposed to Pinyin system. Therefore, their phonological awareness was not sufficient enough to support them in coding English words. In the current study, the participants received Pinyin instruction in primary school. Even they performed worse on English phonological awareness than their English-monolingual peers, they still could utilise phonological skills to support the English decoding process, which might be the plausible reason for the conflicting results.

RAN skills

In terms of RAN skills, our hypothesis that RAN skills would not predict English word reading and spelling accuracy has partially been met. In the current study, even RAN were moderately associated with all literacy variables, we only found it is a significant predictor of nonword reading accuracy. This challenge the argument put forward by Zhou et al. (2018) that RAN only accounts for unique variance in reading fluency rather than word reading accuracy for Mandarin-L1 children. A possible explanation may be that RAN would uniquely explain nonword reading as RAN skills are important for making efficient arbitrary mappings between print and sound. Since pseudowords are unfamiliar words that presumably cannot be automatically recognised as orthographic units but rely instead on phonological decoding. Therefore, when reading nonwords, readers need to complete the translation process efficiently so that the phonological codes can be kept in memory before blending them together to pronounce the word. During this process, each letter in the nonwords are recognised as automatically as symbols in the RAN tasks (e.g., Georgiou et al., 2014). However, for real word reading and spelling, Mandarin-L1 adults would like to recognise these words as “sight words”

Manis et al. (1999) argued that, for reading, what can be uniquely explained by RAN may have to do with the arbitrary mappings of print to sound. This hypothesis predicts that RAN should be more strongly related to irregular word reading than to regular word reading since the former involves more arbitrary mappings between orthography and phonology. This account, however, has been challenged empirically.

Limitations and further research

The first limitation of the Study 1 is that little research has investigated the English acquisition process of Chinese-L1 adults, therefore, we could not make firm conclusion that these results can be generalised to all ELL adults. Therefore, further research is needed to assess the effects of various cognitive-linguistic skills of Chinese-L1 adults and ELL adults from other language backgrounds on English literacy skills to build a more holistic understanding of mechanisms underlying L2 word learning in adults.

The second limitation is that the morphological awareness test used in this study only measured the compound morphology, which is too easy for all participants, especially for English monolingual adults. Therefore, the furture research should assess the relationship between morphological awareness and English reading and spelling ability by using different morphological test to examine whether different aspects of morphological awareness (e.g., derived and inflected morphology) can affect skilled reading and spelling to different extent.

The third limitation is that all participants in the current study were recruited from the same university and especially the monolingual participants were mainly from the Pyschology Course as they could receive research credits by participating psychological studies. From this aspect, the current sample might be too homogeneous, which could

affect the generalisability of these results. Therefore, furture research needs to recruit participants from different course and different universities to examine whether the findings can be replicated.

CHAPTER 3: Study 2

3.1 Introduction

Compared to any other counties, more people are now learning English in China. Within the formal education sector, an astonishingly larger number, an estimated of 400 million, of English learners in China, which accounts for approximately one-third of the whole population in China, compared to about one-fifth of the world population in 2009 (China Daily, 2010). However, only around 30% of these English learners claimed that they would use English in their daily life. Even English is not the dominant or official language and is not commonly used in China, the English language study market is still the world's largest market since 2006, which worth about £3.4 billion (Gamlam, 2016; Bi, 2019). However, the effectiveness of English education in China is still controversial.

Nowadays, China has been a driving force as parents would like to provide their children with the very best in international education (GOV.UK, 2019). In higher education institutions in English-speaking counties, China was the top source of international enrolments in the United Kingdom even with the disruption of COVID on international student mobility (e.g., , United States, Canada and Australia) in 2020 (HESA, 2021). For those Chinese students, English has become a requisite for who would pursue overseas study in English-speaking counties. In addition, English is also viewed as an asset for securing high-paying careers (Adamson, 1995; Sharifian, 2013).

In order to apply for the universities in English-speaking countries or English-taught programmes in other countries, the Chinese students need to provide the results of standard English tests that are accredited globally such as the IELTS and the TOEFL (the American equivalent of IELTS) as a pre-requisite. In August 2012, the Times Higher Education (THE) indicated that the majority of higher education institutes in the UK were

accepting international students to their undergraduate courses (David, 2012). Furthermore, according to the guidance offered by the British Council, for international students whose first language is not English, a band score of 7.0 on IELTS is desirable for the academic courses with high linguistic demands (e.g., Linguistics, Law, Medicine, Social Work and Counselling) and 6.5 for less linguistic demand courses.

With the significant growth in the number of international students in the UK, especially Chinese students, and with the increased competition among universities to attract these fee-paying students have led to concerns about the lowering of standards and the minimum English language requirements for entry into university (Birrell**,** 2006; Watty, 2007). David (2012) mentioned that most universities in the UK, over 58 universities, have adjusted their minimum IELTS undergraduate requirement to 6.0. In addition, if the candidates still fail to meet the requirement, most of the universities in the UK will provide pre-sessional and/or 'top-up' English language courses to the students whose IELTS score is one band or one and half band below the language requirement shown on the offer letter (Bretag, 2007). At Coventry University, for instance, the pre-sessional English language programmes are offered to those whose IELTS score is either one and half band (15 weeks' duration), one band (10 weeks' duration) or half a band (five weeks) below their offer, which included 17.5 classroom hours per week for both undergraduate and postgraduate courses.

The policy-driven and market-driven are two drivers behind lowering entry requirements of IELTS in the universities in the UK (Hyatt, 2013). In terms of the policy-driven, the Department of Education aimed to increase the value of the education market to £35 billion per year and to attract addition of 600,000 international students per year to study in the UK higher education by 2030 (GOV.UK, 2019). As for the market-driven, except for the tuition fee factor, non-price factors such as the reputation of the universities, the location of campus and entry requirements (among others) are also influential factors. Daller and Phelan (2013) indicated that international students are more likely to accept

the offer at the university that requires a lower IELTS score even they understand the low level of English proficiency will adversely influence their academic performance. Therefore, lowering IELTS entry requirements for the courses could potentially be a useful tool for higher education institutions to recruit more international students in order to capture increasing market share (Hyatt & Brooks, 2009).

With the increasing internationalisation of higher education institutions, delivering quality English instruction could be a good way for the higher education institutions in the UK to appeal more international students, which could further contribute to revenue growth and create more employment opportunities (Universities UK, 2014). However, even the international students have met the minimum language requirement of the university or have completed the pre-sessional English language programmes, many of them will still encounter language difficulties in their mainstream university courses (Birell, 2006; Gatwiri, 2015). Empirical evidence indicated that insufficient English competency would let international students whose first language are not English further face a lot of problems including failure in examination, lack of motivation in classroom learning, low academic results leading to low self-esteem and low confidence, lack of peer group acceptance, and even school dropout (Tian & Lowe, 2009; Li et al., 2010). Studentds without adequate English language proficiency could further lead to great frustration for academic teaching staff (Pantelides, 1999; Watty, 2007).

These facts have challenged universities to form a more holistic approach to detect and respond to international students' difficulties and confusion. Baik and Greig (2009) emphasised that the support should be provided by universities to help students develop vital language skills, especially academic English skills, throughout their study programme. When international students enjoy more academic support from the universities, they will have higher student satisfaction (Turner & Garcia, 2005). From this aspect, appropriate supplemental English courses could be one of the key strategies for the universities to appeal more international students.

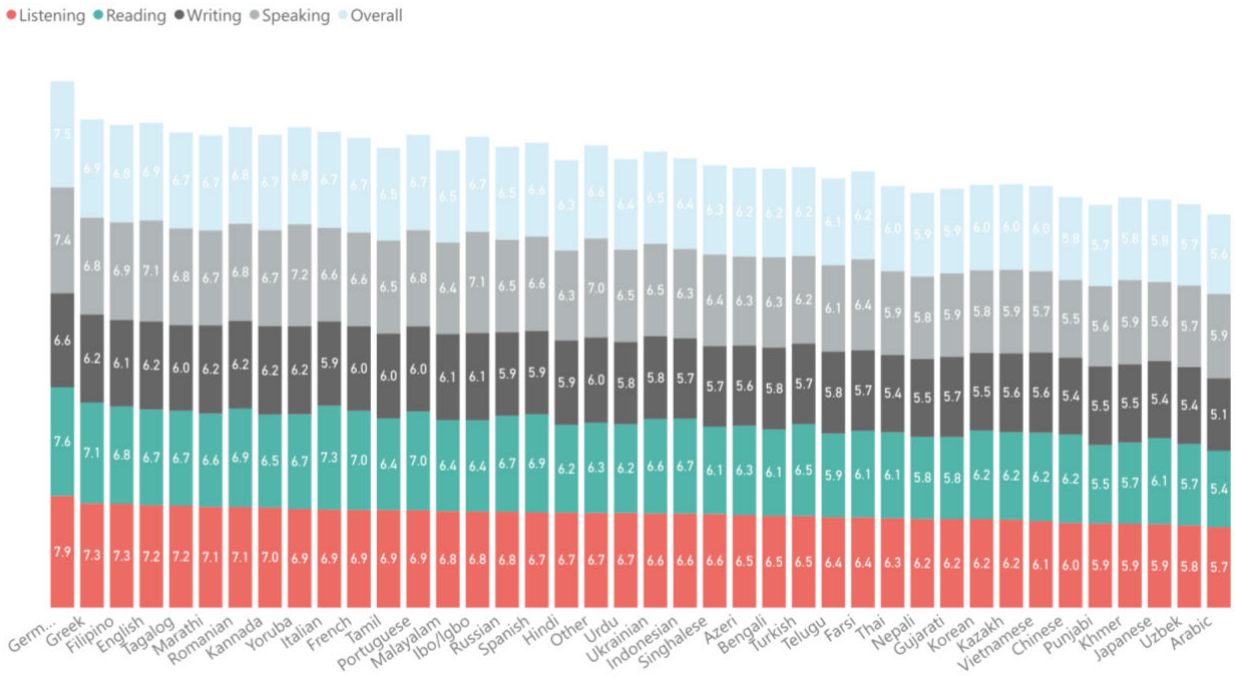
Although most universities in the UK offer a range of language and academic support programmes, the effectiveness of these programmes has been questioned by numerous scholars (e.g., Hansen, 2000; Durkin & Main, 2002; Wingate, 2006) and few research has attempted to investigate the effectiveness of these programmes on student learning outcomes (see meta-analysis: Pearson, 2020). As the international students are from different language backgrounds, their English language proficiencies are varied dramatically (Redden, 2014). Therefore, it is reasonable to shift the focus of research from the cognitive processes that contribute to the English proficiency of ELLs on academic experiences at tertiary education level to the effectiveness of different support methods on adult ELLs' English proficiency, especially on academic English skills. The present study thus aims to make a contribution towards filling this gap in the research.

As the biggest cohort of international students, China is one of the most important markets for UK higher education institutions (Thorpe et al., 2017). However, the performance of Chinese students in the IELTS and the TOEFL tests is significantly lower than students from other counties. According to the statistics from IELTS™ (2018), the level of Chinese students' IELTS scores ranked 34th place out of test takers from the top 40 nationalities (see Figure 3.1). Especially for speaking and writing, the mean scores of Chinese test-takers are the lowest among worldwide test takers. From this aspect, Chinese students who need to study in UK higher education institutions may not meet the admission requirements of universities.

The current study is going to assess the effectiveness of different English intervention programmes for university students. As students originating from China make up the largest group of international students in the UK, the current study would maintain the research focus on the effective English support for Chinese students who attend higher education in the UK. Following, we would first critically analyse English education in China

and attempt to understand the possible reasons that cause the inadequacy of English competency of Chinese students after studying English for so many years. Secondly, the framework of effective curriculum design for ELLs would be discussed. Next, the effectiveness of intervention programmes for ELLs would be critically evaluated. In the end, intervention programmes that aim at improving the academic English skills of Chinese students would be proposed.

Figure 3.1. The mean overall and individual band scores achieved by 2018 Academic and General Training test takers from the top 40 first language backgrounds (source from HESA, 2018)



3.1.1 English education in China

Because of the Open Door Policy in the late 20th century in China, English has gradually been promoted as an essential skill for the modernisation and internationalisation of the nation (Gao, 2012). English language education has been a compulsory subject since Year 3 in primary school – issued by the the Ministry of Education (hereafter MOE) from 2001

(since 1978 English language has been a compulsory course in mainstream education from secondary schools to universities) – most ELLs in China learn English only to pass the exams (Lam, 2005; MOE, 2011; Qi, 2016). Specifically, over 70% of ELLs in China do not use English for daily communication or in the workplace (Gao, 2012). Following, English education in China, especially at the higher education level, will be critically reviewed from six aspects: access policy; personnel policy; curriculum policy; methodology and material policy; resources policy; and evaluation policy. As suggested by Baldauf and Kaplan (2005), in the model for language education policy planning, these elements are necessary to assess if the language policies are successful.

Access Policy

Kaplan and Baldauf (2005) indicated that access policy refers to 'who learns what when'. According to the standard of English language curriculum, as one of the first compulsory subjects (Chinese, mathematics and English), the concept and design of English language courses should focus more on effective interpersonal communication and adopt 'student-centred' approach for all primary and secondary schools (MOE, 2011).

At the tertiary level, English is a compulsory subject for first and second year of studying. There are about 3,000 higher education institutions in China (MOE, 2017). These universities are divided into four tiers. For Tier 1 and Tier 2 universities, they receive government funding to develop their research and teaching qualities. But Tier 3 and Tier 4 universities are relatively poorly staffed and under-funded (Yu, 2016). The inadequacy in resources is also reflected in the English teaching resources allocation in different tiers of universities (Ozturgut, 2011). Compared to Tier 3 and Tier 4 universities, Tier 1 and Tier 2 universities have more opportunities to receive English instruction and take part in collaboration programmes with foreign universities (Wright & Zheng, 2016). Due to inadequate allocation of funding and teaching resources, English education in lower levels of universities is generally ineffective (Wang, 2015).

Personnel Policy

Personnel policy refers to the quality of local teachers and teacher training. In order to achieve effective teaching, understanding how best to train local teachers and what qualifications teachers need are important because improving the professionalism of English teachers could further enhance the quality of English language instruction at all stages (Meng & Tajaroensuk, 2013; Li & Hudson, 2011). However, insufficient oral communicative skills and a lack of confidence in English teachers are serious concerns in East Asia, especially in China (Hu & McKay, 2012).

A study with 341 higher education institutions indicated that up to 2001, 72% of English teachers had a bachelor's degree, 21.9% had a master's degree and 0.3% had a doctor's degree (Dai & Hu, 2009). In addition, the majority of them are merely exposed to any native English speakers and communities. Therefore, the overall educational background of English teachers in China is unsatisfactory and has been challenged because they were taught by traditional approaches in China and had limited access to the authentic English language and the culture of authentic countries (Han & Yin, 2016).

Curriculum Policy

Curriculum policy refers to the objectives of teaching and learning the target language. English curriculum standard in China is the minimum target to ensure the quality of English education and commitment to excellence, striving to clearly define expected learning outcome, expounding learning contents, and the expected outcome should be observed. However, from the qualitative study that was conducted by Yan (2015), the English teachers reported that the current goal of the English curriculum in China is still oriented by the national English tests. The National University Entrance Qualifying Exam

(Gaokao) and the College English Test -4 and -6 (CET-4 and CET-6) are the main standardised English tests that are used to assess students' English language ability.

In order to boost students' exam performance, little attention was perceivable to lesson objectives, coherence and transition between teaching steps. Due to the lack of a national curriculum, teachers, hence, mainly focus on highlighting 'test points' and adopt the teacher-centred approach and grammar-translation method rather than focus on interpersonal communication skills and student-centred approach that suggested by the communicative language teaching framework , which limited student engagement with the materials and the practice of the language that further restricts acquire new language patterns (Doman & Webb, 2017; Jin et al., 2017).

Methodology and Material Policy

These policies deal with which methodologies and materials are employed over what periods. Before 2001, the teaching of English was not standardised because it is not recognised as an important subject in the national curriculum. The availability of qualified teachers, hence, were limited, and students lacked appropriate teaching materials and textbooks (Wang, 2007).

That is, there are significant regional differences in English proficiency and strategies of language learning in China (Hu, 2003). Even English has been officially assigned as a compulsory subject for the first two years at the tertiary level, there is no official textbooks for teachers to choose from. The teaching materials and pedagogy of English courses will be decided by each university itself, which could further cause the teaching qualities of English courses to differ widely from university to university (Qi, 2016).

In terms of teaching method, English education in China constantly uses teacher-centred and book-centred approaches. In the class, the teacher enjoys the dominance and the learning process mainly emphasis on repetition rote memorisation (Doman & Webb, 2017). As for the learning activities in the class, teachers mainly devote themselves to sentence translation, multiple-choice and grammar analyses. Minimum independent learning or use of the language for communication purposes is included. For reading comprehension, Chinese students would like to understand the exact meaning of every single word in the texts, which lead to a low tolerance of unfamiliar words. Incidental learning is not available in the class.

Learning under this traditional pattern, even the learners have a relatively big vocabulary size, they still cannot use these words when they need them. Moreover, based on the traditional teaching approach and curriculum design, most of the English textbooks in China are designed for grammar analyses, reading comprehension and writing. Some listening and speaking contents are included in the textbook, but both students and teachers prefer to skip these activities. Another feature of English teaching in China is that students would not have extensive exposure to the English language after the class. In the English language class, the instruction language is still Chinese. In conclusion, the limited exposure to the English language, especially authentic English language, in the class and after the class only be enough for students to understand the structure of the language superficially, but it does not allow students to have the opportunities and environment for practising, which further lead to insufficiently English competence of Chinese English learners in general (Fusheng & Rao, 2007).

Resources Policy

Resource policy refers to financing. Increasing evidence indicated that in some areas of China, students would not be able to access English education easily (Feng, 2012). This is because of the dramatic financial differences between rich provinces and poor provinces

and also between urban areas and rural areas. These differences lead to fewer opportunities and lower quality of teaching, which could influence the learning process adversely. The English learners in the rich coastal areas have a richer English educational experience than those in the poor rural areas (Cortazzi & Jin, 1996; Nunan, 2003). Compared to rural students, children in urban and city areas such as Beijing and Shanghai have more resources and have received more support in terms of English learning. For example, English private tutoring has become a very popular approach in those developed and wealthy cities and regions in China. For rural families, however, it is hard for parents to maintain extra education investments for their children due to the economic disparities between urban and rural areas. In addition, in remote and rural areas, the teaching quality and resources of English education may be inadequate (Qi, 2016).

In China, although English has been taught as a foreign language over decades from the primary school level, it is still not a language that has been widely used as a mean of communication. Even the use of English has gradually risen in some certain areas of China on social media platforms and international companies (Feng, 2012), the majority of Chinese people still have limited opportunities to use English for communication purposes. Under this situation, it is considered to be hard for English learners to be exposed to an authentic English-speaking environment, which is an essential factor for achieving communicative competency in English. For learners who want to get more chances to use English, learners might need to invest extra resources to achieve this goal (e.g., money and time). This situation might widen the gaps in terms of accessibility and English competence in different areas of China.

Evaluation Policy

Evaluation policy refers to the relationship between assessment and the educational objectives stemming from methods and materials that are used. At the university level, all students have to study English for at least two years. Universities also strongly recommend

students to take the CET-4 and CET-6, which could improve their employment prospects if they pursue a career in international companies (Lam, 2005; Cheng, 2008).

For The National University Entrance Qualifying Exam, which is commonly perceived as Gaokao in China, it is necessary for all students to take part after Year 12 and as a part of the university application process. As one of the three core subjects, English is worth the same weight as Chinese and mathematics in the Gaokao. Therefore, the motivations of the English learning process are directly related to the pressure of Gaokao, which is the opportunity to enter a better university (Qi, 2016). College English test, which is considered to be the tests with high reliability and validity, is commonly used to examine college and university students' English proficiency (Zheng & Cheng, 2008).

For the English examination system in China, such as English tests in Gaokao and CET, they only access listening, reading and writing abilities; however, the speaking test is optional for students. From this aspect, researchers (Doman & Webb, 2017) criticised that across the 12 years of English learning and even till higher education level, vocabulary, written performance and reading comprehension are the only focuses for Chinese students to learn English. The value of these English tests, therefore, has been questioned and has attracted much attention from both academia and education practitioners.

Because of the examination system, the reality of English teaching in China still follows the traditional mode: teacher-centred and examination-driven, rather than focus more on effective interpersonal communication and student-centred approach that MOE recommended. English education in China is primarily for examinations and admissions rather than learning English as a language for use (Cortazzi & Jin, 1996). To this content, English education in China has never escaped from the criticism of 'teaching-to-the-test', and therefore produced 'deaf and dumb' English learners (Tang & Biggs, 1996; Cheng &

Wang, 2012). From the aforementioned aspects, there are still many challenges that the English education pathways and policymakers need to face.

Statement of the issues in English education in China

The traditional patterns of teaching and learning English in China have been widely criticised as a methodology that produces only test-takers rather than competent English users. Even English being taught to English language learners in the Chinese education system for many years, they have not been given adequate exposure to authentic and appropriate English through instructions (Doman & Webb, 2017).

The assessments of English have already become a key role in the attitudes toward meritocratic policies in China (e.g., Butler & Iino, 2005; Carless, 2012). Under this social value, the achievement that the person made was primarily considered as a result of hardworking rather than innate talent (Cheng & Curtis, 2009). Exams are also be treated as an assessment of effort and diligence, rather than a medium for communication. In addition, English exams in China are wildly accepted as a shortcut to success and higher social status, which completely violated the purpose of learning a new language.

Standard English tests in China have a significant influence on learners' future educational and career opportunities, the innovations are requisite for English education in China, which should focus more on how to improve students' English proficiency. Research has shown, as ELL learners, insufficient language competence exists among university students in various aspects including small vocabulary size, low reading fluency and poor comprehension in practice and so forth. (Jiang, 2008). Limited language proficiency of Chinese students on reading accuracy and comprehension are caused by both the educational trend that emphasises "look and say" method, especially the absence of listening and speaking practice opportunities, which further cause the instruction

approaches in English education in China are quite insufficient (Cai, 2015). Many researchers and practitioners have been emphasising the importance of vocabulary learning, analysing the grammatical structure of long and complicated sentences, and strategies and skills for test-taking; but not that of achieving English accuracy, fluency and proficiency. From this aspect, the fundamental issues with Chinese ELLs in the English acquisition process need to be further understood and explored.

3.1.2 The development of English spelling ability

Spelling is perceived as a prominent skill for both reading and writing, especially for university students. The mistakes in spelling could directly make the written material hard to read and understand (Altamimi & Rashid, 2019). Spelling errors could devalue the quality of their assessment (e.g., written examination, coursework, and lab reports) because the errors might change the meaning of the words and cause misunderstanding of the written materials. Lower assessment scores could be brought about by spelling errors compared to the coursework without spelling errors (Al-Zuoud & Kabilan, 2013). Difficulties in spelling could also further influence word choices. That is, spellers would be less likely to choose the words they cannot spell or have difficulties in spelling, which could further prevent them from expressing their arguments and/or ideas accurately and succinctly (Graham & Santangelo, 2014). Spelling ability is therefore considered as a pivotal skill that is related to academic performance, especially for university students. To achieve effective writing, individuals must acquire sufficient spelling ability and academic vocabulary knowledge.

English word spelling requires individuals to acquire knowledge of functional units of letters and/or letter clusters, letter names and phonemes, so they would be able to synthesise phonemes into graphemes to complete spelling tasks (Coltheart et al., 2001). Although phonological awareness is essential for spelling, individuals need to govern the correspondence between grapheme and speech sound or sounds and then place the

letters or letter clusters to the appropriate positions based on the speech sounds. However, as an inconsistent language, the same grapheme in English could be used differently with different sounds. For example, the sound /e/ could be spelt in several ways (e.g., the *a* in *many*, the *ai* in *said*, the *e* in the *end*, or the *ea* in *dead*). Due to the inconsistency of English spelling, full mastery of sound-letter correspondence alone would not be effective enough in English spelling (Kohnen et al., 2010). Spelling, as a result, becomes a complex skill to acquire and requires a more profound knowledge of the words because of the overlapping occurrences (Caravolas et al., 2001).

From the theoretical perspective, Read (1971) indicated that there are three layers of English orthography that would affect English spelling development: alphabetic, pattern and meaning. This English spelling development process has been further described in five stages, which runs parallel to the three layers of English orthography (Henderson, 1981).

During the first stage, *the emergent stage*, spelling activities mainly consist of scribbles with syllable awareness (Mesmer & Williams, 2015). Learners would be able to develop a basic understanding of consonants and vowels within syllables, and they have also acquired the names of partial letters (Bear et al., 2012). Towards the end of this stage, learners could match what they know about the text with letter names or the prominent sounds and letters (e.g., G for *alligator*; Templeton & Bear, 2018).

At *the letter name-alphabetic spelling stage*, learners would acquire letter-sound correspondences inherent in the alphabetic principle to support their spelling ability. They only use letter names to spell words because of their tacit phonological knowledge. Their spellings, therefore, are very transparent and only a few vowels are used (Templeton & Bear, 2018). For instance, learners might spell *hug* as HG. Later on, with more spelling

experience, learners become aware of consonant digraphs and vowels in their writing. However, learners still rely heavily on articulating long vowels and consonants as the letter names match the sound of long vowels. For example, the /eɪ/ in *plate* and the letter name *a* are pronounced the same. Learners would spell AT for *eight* (Bear et al., 2018). In this stage, phonological awareness is a vital skill for spelling achievement. Towards the end of this stage, learners would be able to spell most short-vowel patterns (CVC) words, master letter-sound correspondences, match the words in the text with syllabic units and understand the alphabetic layer of English orthography (Templeton & Morris, 2000).

In the next stage, *the within word pattern stage*, after they master the spellings of most short vowels, consonant digraphs and blends, they would progress to the pattern layer, which is superimposed on the alphabetic layer. In this stage, learners would be able to recognise groups of letters with more abstract patterns and generalise these patterns to other spelling activities (Bear et al., 2018). For example, they would grasp vowel patterns and diagraphs (e.g., CVV: *ie* in *lie*; CVCe: *i-e* in *time*; CVVC: *ai* in *rain*) and more complex vowel patterns such as *ought* in the word *thought*. However, sometimes the learners might confuse some ambiguous vowel patterns in which the sound is neither long nor short. Their errors reflect this confusion: WATE for *weight*; TEEM for *team*. Towards the end of this stage, learners would be able to spell most of the vowel patterns and low frequent consonant digraphs (e.g., *ck* in *kick*; *wr* in *write*; *spl* in *split*; Templeton & Bear, 2018).

As learners become more familiar with most spelling patterns within single-syllable words and can spell most of them correctly, they would progress to *the syllables and affixes spelling stage*. In this stage, learners progress to the meaning layer, where they are able to further expand their orthographic knowledge with assistance from morphological elements (e.g., prefixes, suffixes) to facilitate their English spelling acquisition process (Helman, 2004; Williams et al., 2017; Bear et al., 2018). They learn to spell polysyllabic words and could use inflections to change the meaning, usage and spelling of words (e.g., -

ing signifies present progressive tense: *playing*/*listening*; *-ed* signifies past tense: *played/ listened*). Their spelling errors reflect that they tend to misspell unaccented syllables (e.g., CONFUDINT for *confident*) and some prefixes and suffixes (e.g., PER- for *pre-*; -SION for -*tion*). Toward the end of this stage, learners would be able to consolidate their knowledge between spelling and meaning as they could use prefixes and suffixes to assist with successful spelling activities (Ness, 2010).

The last stage of spelling development is called the derivational relations spelling stage and most learners in this stage are in secondary school and even adults. The critical component that learners rely on is derivational morphology in this stage (Bear et al., 2018). That is, learners tend to use morphemes (e.g., Greek and Latin roots, affixes and bases) to spell more efficiently. They become aware of spelling-meaning connections such as *play*, *playable*, *player* and could therefore expand their vocabulary lifelong (Templeton & Bear, 2018). Learners would also examine the meanings of Greek and Latin roots and then apply these morphological features to assist them in spelling activities. For example, they might discover the meaning of *syn-* and *sym-*, which mean "together", to help them spell words like *synonym, synthetic* and *sympathy*. Therefore, learners in this stage are advanced or skilled spellers who can read and write sufficiently and fluently (Bear et al., 2008).

English spelling development has been conceptualised as a gradual progression through five qualitatively different stages and the three layers of English orthography as described by the above model of spelling development. This development sequence has also been observed by many researchers in different alphabetic orthographies (English: Morris et al., 2003; Spanish: Helman et al., 2016; French: Sprenger-Charolles et al., 1998). However, Treiman and Kessler (2014) criticised the developmental sequence in the stage theory as too rigid and fixed and neglected the fact that learners might use more than one type of knowledge at each stage to produce spellings. Despite the skills that learners use to spell words might be overlapping across stages, English spelling development in general

progress from relying mainly on letter-sound relations to processing more complex meaning-spelling relations as the stage model discussed above (Bahr et al., 2009).

Spelling would become more challenging because it requires the learners to move from the alphabetic layer, which mainly focuses on sound-symbol relationships, to the meaning layer that focuses on spelling for meaning (Templeton & Morris, 2000, cited in Williams et al., 2017, p. 286). Furthermore, compared to learning to read, the English spelling acquisition process is believed to be more challenging, even spelling ability is strongly related to reading ability (Westwood, 2008; Foorman & Petscher, 2010; Treiman & Kessler, 2014). For reading, when learners are asked to read out a new word, they only need to recognise familiar patterns that are included in the target word and then apply the knowledge of the alphabetic principle to decode those patterns, which is considered as a recognition process (McKenna & Stahl, 2009). Compared to reading, spelling is perceived as a retrieval process rather than an encoding process, in which the learners have to retrieve the patterns from memory. As reading and spelling are two different processes, Westwood (2008) suggested that the skills used in reading could not transfer to spelling automatically. Direct and explicit instruction with intensive practice is, therefore, needed. Previous studies have confirmed the vital role of explicit spelling instruction in enhancing the spelling ability of English-L1 learners and facilitating their spelling acquisition (see meta-analysis: Graham & Santangelo, 2014).

Empirical research was also evident that ELLs from both alphabetic and non-alphabetic backgrounds also demonstrated a similar developmental sequence to English-L1 speakers in their spellings, the progression through the alphabetic, pattern, and meaning layers of English spelling development (Helman, 2004; Yeong et al., 2014; Bear et al., 2018; Kiernan & Bear, 2018). Therefore, it would be reasonable to believe that the explicit spelling instruction that was successfully conducted with English-L1 learners could also benefit ELLs spelling performance.

3.1.3 The acquisition of English spelling skills

As abovementioned, mastering spelling skill is extremely important for students' literacy development and their academic success as well. In order to assist students to develop sufficient spelling skills, educators and/or researchers need to help them minimise the constraints on their spelling and writing activities (Graham & Santangelo, 2014). However, as an inconsistent language, English spelling skill does not simply rely on phoneme-grapheme correspondence. While phoneme-grapheme correspondence could enable spellers to utilise the tactical and procedural rules to spell out English words once these rules are acquired, but these rules cannot be generalised to spellings for all words in English (Cummings, 1988). Purely relying on tactical and procedural rules will lead to misspelt irregular words. In order to become a competent speller, individual needs to spell both regular and irregular words accurately and efficiently by employing different skills. However, currently, there is no consensus on the best approach to achieve spelling competence. The long-running debate is about spelling competence is acquired by the "caught" approach or the "taught" approach (Schmitt, 2007).

"Caught" approach of English spelling acquisition

According to advocates of the "caught" approach, English spelling is acquired naturally and incidentally (Graham, 2000; Meeks & Kemp, 2017). Their viewpoint is that spelling competence is achieved incidentally without explicit teaching and/or training and through informal routes (e.g., peer-tutoring; writing practice; reading comprehension). Such instructions are prone to learning new vocabulary implicitly without a specific focus on the spelling of the word itself (Hong, 2010). It, furthermore, encourages learners to pay more attention to comprehend the meaning of the contexts and acquire the new word and its spelling as by-products. The incidental learning approach emphasises extensive reading so that learners could pick up new words and spellings by guessing the meaning of unknown

words based on the context and or using dictionaries and glosses, and so on (Ahmad, 2012; Graham & Santangelo, 2014).

Empirical evidence suggested that children could benefit from the incidental spelling approach through activities such as extensive reading and writing more than intentional learning (Graham, 2000; Krashen, 2002; Meeks & Kemp, 2017). Graham (2000) conducted a meta-analysis and found that without formal instruction on spelling, learners could still acquire spelling skills with little or no prior spelling instruction and their performance on spelling tasks were as good as learners who received systematically training on spelling, which supported spelling competence could be achieved naturally and effortlessly. However, Graham's findings were only for very young children with little spelling experience. After Year 1, the effect of the "caught" approach has disappeared. In addition, Graham did not take poor spellers and atypical spellers (e.g., children with learning difficulties and children with special needs).

"Taught" approach of English spelling acquisition

On the contrary, the proponents of spelling is "taught" approach recommended that spelling attainment could be achieved only when the learners memorise the new words by rote learning and explicit teaching (Moat, 2005; Schlagal, 2007; Graham & Santangelo, 2014). The researchers believe that formal training on spelling plays a vital role in spelling competence, therefore, English spelling acquisition is a more intentional process rather than the incidental process (Richards et al., 2002). Specifically, the advocates believed that the essential skills (e.g., the alphabetic principle, knowledge of phonemic structure) for spelling competence could only be shaped by formal spelling instruction.

Graham and Santangelo (2014) conducted a meta-analysis with 53 studies on spelling interventions. After reviewing these studies, researchers indicated that spelling instruction

is effective for improving individuals' spelling performance. Specifically, they found that spelling gains were achieved by direct and systematic spelling instruction among Year 1 to Year 10 students. In addition, the effectiveness of the formal spelling instructions was also found for atypical spellers. More importantly, they also found that the spelling instruction effect could be maintained over a short period of time (from one week to six months); however, whether the effect could be maintained for a longer term is unclear.

According to the strong supports from the "taught" approach of spelling acquisition, we believe that direct and systematic training on spelling skills are necessary. This is because that even the "caught" approach could also promote spelling ability, but it is only effective for very young learners. In the current study, we aimed to enhance the spelling ability of adult Mandarin-English ELLs. Although their English literacy skills are significantly lower than their English monolingual peers, which was detected in Study 1, they already had considerable experience with English spelling. Therefore, in order to achieve further spelling improvement, they should receive systematical training on spelling skills.

3.1.4 The Importance of vocabulary learning

With growing numbers of international students, higher education institutions in the UK face pressure to ensure the effectiveness of instructional practices to provide adequate support for the students, so that ELLs could develop sufficient academic English proficiency to smoothly enter into university-level education, which could improve student satisfaction and build a better reputation among international students to further appeal more international students (Sloan & Porter, 2010; Thorpe et al., 2017).

Within the past decades, a wealth of research has focused on the effectiveness of interventions aimed to support English reading comprehension, reading fluency and bilingual education among ELLs in higher education institutions (e.g., Li, 2018; August et

al., 2014; Greenleaf et al., 2011). However, in order to improve English proficiency, vocabulary has been widely considered as a requisite component. Nation (2001) states that, for English, there is a reciprocal relationship between vocabulary knowledge and language proficiency. Specifically, if an individual has good vocabulary knowledge, he will have a higher chance to perform satisfactorily in the language acquisition process. Besides, language uses (e.g., listening, reading, speaking and writing) could further enhance the individual's vocabulary knowledge. Vocabulary, therefore, is key to English proficiency and a successful English language acquistion process (Kieffer et al., 2016).

As for university students, the acquisition of academic vocabulary has been viewed as a requisite for the development of essential study skills and for their academic achievement (Nation, 2001; Kieffer et al., 2016; Masrai & Milton, 2017; Masrai & Milton, 2018). That is, due to the limited classroom time, academic teaching staff would not have enough time to cover everything that is needed to be learned in the class. The students, therefore, are required to learn independently mainly from reading (Lei et al., 2010). The students have to understand the language used in the academic materials to complete independent learning (Schleppegrell, 2004; Nagy & Townsend, 2012). Moreover, academic vocabulary knowledge leads directly to successful reading comprehension (Cromley & Azevedo, 2007). If the students do not know the meanings of the words, they might misunderstand or fail to process the concepts in reading materials. On the contrary, if the students have sufficient academic vocabulary knowledge, they could immediately and effortlessly use reading strategies to understand academic materials efficiently instead of spending extra mental resources to attempt to comprehend the meanings of unknown or unfamiliar academic words (Masrai & Milton, 2018). Academic vocabulary knowledge, hence, is a fundamental part of academic success for university students, especially for international students.

Native English speakers have an estimate of vocabulary size at 50,000 when they start to study in university (Stahl & Nagy, 2007). However, for the IELTS test, to achieve 6.5, which

is commonly required for most of undergraduate and postgraduate courses, students only need to master an estimate of vocabulary size at 6000 to 7000 frequently used words for both academic and societal settings (Chujo & Oghigian, 2009). Compared to English native speakers, when international students enter university, their vocabulary size is significantly smaller than their English monolingual peers. Thorpe et al. (2017) mentioned that insufficient vocabulary size is the main obstacle for the English acquisition process, especially for English language learners. For ELLs, the lack of academic vocabulary knowledge is the main barrier to apprehend academic materials and academic success in university (Anjomshoa & Zamanian, 2014; Lesaux et al., 2014).

Roche and Harrington (2013) conducted a study to investigate the relationship between English academic vocabulary knowledge and academic performance. They recruited 70 Arabic-L1 university students in an English language medium university in Oman and assessed their academic English written proficiency by using a written task, which was adjusted from IELTS materials and English vocabulary knowledge by using a timed YES/NO response test (TYN test). The written proficiency task required participants to write a 250-word essay on the given topic "Oman in the past, Oman in the future" in 40 minutes. The words included in this TYN test were selected from the most frequently used words in the British National Corpus (Harrington & Carey, 2009) and pseudowords that are phonologically and orthographically correct but have no meaning (e.g., blurge). Participants were asked to judge whether the words were real words or pseudowords. The researchers found that Arabic-L1 ELLs' vocabulary knowledge and written proficiency were significant predictors of their academic performance. In addition, these participants showed greater difficulties with English spelling in completing the written proficiency task. That is, if ELL university students have weak vocabulary knowledge, they have poorer academic English proficiency and are less likely to succeed in overall academic performance. These findings are consistent with previous research indicating that vocabulary knowledge is a prerequisite for academic achievement in English-taught programmes and the universities in English-speaking countries (Kırkgöz, 2005; Murray, 2012). Morever, Hsueh-chao and Nation (2000) conducted a similar study. They recruited

66 ELL participants from a university in New Zealand. These participants came from different language backgrounds: Chinese, Korean, German, Indonesian, Japanese, Thai, Vietnamese and Ni-Vanuatu. Hsueh-chao and Nation found ELLs' vocabulary knowledge could significantly predict their reading comprehension and written proficiency, which are critical factors of academic achievement at the tertiary education level (Qian, 2002). From this aspect, the effectiveness of interventions that could facilitate new vocabulary acquisition, especially academic vocabulary acquisition, of ELL university students is needed.

Based on this, Gersten et al. (2007) proposed five recommendations that can potentially strengthen ELLs' literacy skills: (a) screen their study progress and identify learning problems in time, (b) design small-group literacy intervention programmes (c) deliver extensive intervention with a focus on academic vocabulary, (d) develop academic English skills and (e) provide regular peer-assisted learning opportunities. The development and evaluation of the effective intervention, focusing on enhancing academic English skills, especially on academic vocabulary, is therefore worth investigating as successful intervention programmes could prevent ELLs from academic failure (Bifuh-Ambe, 2011).

3.1.5 The methods of English vocabulary learning

As abovementioned, academic vocabulary is an essential component for ELL learners to attain adequate proficiency and fluency at the university level. Similar to the English spelling acquisition process, successful acquisition of English vocabulary could be achieved with two diverse approaches: the intentional approach and the incidental approach. The intentional way refers to the use of tasks (e.g., crossword puzzles, synonyms, multiple-choice) to facilitate vocabulary learning. This approach requires learners to focus on the target word specifically with the use of deliberate techniques (e.g., studying from vocabulary notebooks, word lists, and word cards) to achieve vocabulary learning (Ahmad, 2012). On the contrary, incidental learning emphasises that vocabulary gains will be

achieved via extensive exposure to contexts that include the target words (Shahrzad & Derakhshan, 2011). As it is an implicit approach, vocabulary learning is normally taking place during independent learning (e.g., reading and listening). In these activities, learners could get contextual clues, which could assist learners in understanding and learning the words (Hong, 2010).

Empirical evidence suggested that children could benefit from incidental vocabulary learning through extensive reading more than intentional learning. Within a short period of time, they could acquire more vocabulary in their first language with a higher retention rate (Hulstijn & Laufer, 2001; Nation, 2001). In addition, other studies also found that incidental learning is more effective in developing reading skills and fluency, and it could further increase learners' motivation for reading and learning (Waring & Takaki, 2003).

The reciprocal relationship between incidental vocabulary learning and language competence was also found in L2 vocabulary learning process (see meta-analysis: Waring & Nation, 2004). In a comparative study of the effectiveness of incidental and intentional vocabulary learning.

Ahmadi (2017) recruited 35 ELL students between the age of 18 and 28 from a university in Iran and randomly divided them into three intervention groups: the form-focused group, the meaning-focused group as incidental vocabulary learning condition, and the intensive reading group as intentional vocabulary learning condition. In the form-focused group, participants were required to read the story prepared by the researcher in each session and write down any unknown words from the story in their notebooks. Then they needed to look up the words in a dictionary. Participants in the meaning-focused group were allocated to the same stories as the form-focused group, but they were required to orally share the stories with their classmates and also talk about their own opinions about the stories after they finished reading. As for the intentional reading group, participants

were given some passages incorporated with ten target words in each passage. In the class, the teacher explained the meaning of the target words in the target language, English, and provided some examples of how to use the words in context. Participants were then asked to memorise and revise these target words after the class. After receiving eight intervention sessions, all participants were tested for vocabulary knowledge of all the trained words. Ahmadi found that participants in all three groups demonstrated some gains in English vocabulary knowledge, but adult ELL learners in the intentional vocabulary group acquired more words than the incidental group. The findings of this study contradicted the previous students, which emphasised that incidental learning is more efficient than intentional learning (Barcroft, 2009; Bruton et al., 2011; Ponniah, 2011).

Ahmadi indicated that even incidental learning has been identified as a sufficient method to facilitate English vocabulary acquisition for ELLs, intentional learning would be a better strategy for word memorising and retention, especially for ELLs with relatively small vocabulary size. Specifically, for English-L2 learners, it might be hard to guess the meanings of the unfamiliar words correctly sometimes due to insufficient word knowledge and limited proficiency in English. When the learners encounter overwhelming texts with a great number of unknown words in the incidental learning process, they will feel frustrated and lose motivation, which could further lead to unsuccessful language learning (Kondal, 2015). Therefore, incidental learning will only be effective when the contexts are well understood, which requires substantial vocabulary size as a basis for subsequent learning (Hong, 2010). However, Ahmad's study also has some limitations. For both pre- and post- tests, Vocabulary Knowledge Scale (VKS; Paribakht & Wesche, 1997) was used to measure whether participants know the meaning of the target words. The rating scale of VKS requires individuals to score the target words based on the following criteria:

1. I don't remember having seen this word before.
2. I have seen this word before, but I don't know what it means.
3. I have seen this word before, and I think it means _____ (synonym or translation).
4. I know this word it means _____(synonym or translation).

5. I can use this word in a sentence: _____. (Paribakht & Wesche, 1997, p.180).

This self-report scale could only assess participants' recognition or recall and the key knowledge of the target words (e.g., the most common meaning of the word; Bruton, 2009). It was reasonable that the intentional intervention group in Ahmadi (2017) study made more progress than the other two incidental learning groups as the teacher in the intentional group explicitly taught all these information during the sessions, and the participants were required to memorise and revise all these information after the class. The two incidental learning groups focused more on reading comprehension without explicit instruction in the target words. Therefore, the measurement used to assess the participants' vocabulary knowledge in this study was unilateral. In order to better evaluate the effectiveness of incidental learning and intentional learning, multiple tasks should be considered to measure vocabulary learning from different angles (e.g., lexical knowledge, comprehension, spelling; Qian, 2002). Moreover, Ahmadi only used the target words to assess the effectiveness of the intervention programmes. Without untrained items and follow-up tests, the generalisability of the study results is, hence, unclear.

Even incidental learning approach has been proved as an effective approach for vocabulary learning for ELL learners, other studies have criticised this approach, especially for the acquisition of L2 vocabulary process (e.g., Wesche & Paribakht, 2000; Lin, 2014). Unlike native speakers, ELLs may not have enough opportunities to be exposed to the unknown words repeatedly, unless they are high-frequency words (Hong, 2010: 59). Without repetition in this process, the acquisition of the target words could not be guaranteed because the learners would not be able to form solid vocabulary knowledge in their lexicon with non-recurrence words (Huckin & Coady, 1999). Previous study suggested that when the learners' vocabulary size is less than 3,000 words, the incidental approach would not be suitable for them. For the first 2,000 to 3,000 words in English, explicit vocabulary instruction, which uses the intentional approach, is more suitable for these learners, especially for ELLs (Lin, 2014).

3.1.6 The effects of orthographic and phonological training on English word spelling for English monolinguals

National Reading Panel (NRP, 2000) explained components of reading consist of phonological awareness, phonics, fluency, vocabulary, and comprehension. National Early Literacy Panel (2008) further elaborates that early literacy skills that can be precursors for later literacy achievement include decoding, oral reading fluency, reading comprehension, and spelling. From this aspect, phonological awareness has been considered as the most important cognitive-linguistic skill in the acquisition of English reading and spelling.

From the developmental perspective, before children start to learn how to read and spell words in English, they were already equipped with a mental representation of the meanings and the pronunciations of the words in their long-term memory, which were acquired by listening and speaking (Kilpatrick, 2015). When children are required to read and spell words, they need to build connections between sight words and phonemes. However, phonological awareness, especially phonemic skills could not be acquired naturally through the English acquisition process, which is why deliberate teaching and extensive practice on English phonological awareness are needed to support the development of English literacy skills (Phillips et al., 2008). Thus, phonological awareness has become one of the most popular research topics in English acquisition and development areas. Furthermore, a great number of researchers emphasised the necessity of providing phonological awareness instruction in early education to support the acquisition of English literacy skills. The intervention programmes focused on phonological awareness skills that could help children strengthen their ability to decode words correctly and to further improve reading and spelling have been supported by a wealth of converging evidence (see meta-analysis: Ludwig et al., 2019). National Reading Panel (2000) examined the effects of 52 studies of phonological awareness instruction and 38 studies of phonics instruction that were conducted with native English students. The results indicated that, compared to other alternative intervention approaches,

phonological awareness instruction was more effective in helping children master phonemic awareness, which could further enhance their abilities of word reading (d = 0.53) and word spelling (d = 0.59). From this aspect, phonological awareness intervention is an indispensable method for English-L1 learners through early education. Furthermore, the phonological intervention programmes that successfully improved young children's reading and spelling abilities were also proved to be efficient in helping children with learning difficulties (Szenkovits & Ramus, 2005; Melby-Lervåg et al., 2012).

More recently, the benefits of phonological awareness training programmes could be maintained in the long run. Hulme et al. (2012) conducted an intervention study with 152 English monolingual children. Children were randomly allocated to two intervention programmes (phonology-and-reading training with a focus on phoneme awareness with book reading and oral-language training focused on vocabulary development, speaking and listening skills) and received 20 weeks of intervention. They found that the phonological awareness training resulted in improvements in phoneme awareness, letter-sound knowledge and word reading and spelling abilities. These effects were still noticeable five months after the completion of the intervention. From this aspect, explicit training on phonological awareness, which is considered as an intentional learning approach, is more effective than oral-language training, which is an incidental learning approach, on young children. Furthermore, this study also indicated that the vital role of structured teaching of the alphabetic principle in learning to read and spell effectively. Similar results were also reported by Castles et al. (2011). However, Hulme and his colleagues' study was conducted with children with poor verbal ability, which might the factor that leads to the insignificant treatment effect of the oral-language intervention on literacy skills. Future research should examine whether significant improvements in English literacy skills could be found when children with normal verbal ability receive the oral-language intervention.

When it turns into the role of orthographic knowledge in the acquisition of English literacy skills, as English words are neither spelt strictly based on phoneme-grapheme correspondence nor spelled with random strings of letters (Treiman & Bourassa, 2000), Moats (1995) indicated that once the spellers acquired orthographic generalisation rules in English, they would be able to utilise these rules in helping them spell accurately and efficiently. For example, some letters could not be doubled within a syllable in English spelling such as letter *j* and *y*. The letter *e* indicates when a vowel is long, as in *make* and *ride*. It also indicates when a *c* or a *g* should have its "soft" sound, as in *page, piece,* and *price* (Pittman et al., 2014, p.110). As a consequence of the inconsistency of English spelling, spelling competence could not be achieved by simply applying phoneme-grapheme rules (Seymour et al., 2003). A higher level of orthographic skill could positively influence children's spelling ability and vice versa (Moat, 2005; Shanahan, 2006). Therefore, intervention programmes should be designed to cover orthographic spelling rules and also introduce how to apply these rules during spelling (Ise & Schulte-Körne, 2010).

When it turns into the effects of orthographic training on English literary skills, only a small number of studies have investigated children's acquisition processes of reading and spelling through orthographic training approach (Share, 1999; Cunningham et al., 2002; Bailey et al., 2004). For example, Bowey and Muller (2005) conducted an orthographic intervention study to examine the intervention effect on reading. They created twelve stories containing the target pseudowords. During the training, each target pseudoword appeared in twelve stories four times. After two 30-minutes silent reading sessions, children's reading and orthographic skills were examined again. They assessed the participants' orthographic learning using an orthographic choice task that consisted of the target word (e.g., ferd), the visually similar word (e.g., fard), and a homophone (e.g., furd). Children identified the target word successfully over the homophone and visually similar word, indicating that orthographic learning has been achieved by exposure to the target word with minimal reliance on phonological awareness. Evidence of improving on reading trained words was evident in a faster naming for trained pseudowords over the

homophones of the target words. These results were in line with the self-teaching hypothesis (Share, 1995). It further implied that the mutual relationship between orthographic knowledge and reading ability. In addition, this study also indicated that the orthographic knowledge could be acquired through the self-taught approach as long as they will be exposed to orthographic-specific orthographic representations (Rayner et al., 2001). However, this study only included two intervention sessions, and each lasted for 30 minutes. In addition, a follow-up test was not included, which further limited the researchers to detect the "true" positive effect of the intervention programme and to examine if the treatment effect can maintain for the long term. Furthermore, the study only delivered one intervention programme, which found that incidental learning was effective for English monolingual children. We could not compare if this approach is more effective than the intentional learning approach. Further research might need to conduct a similar study with a longer intervention time and to include an intentional learning group and a control group to check the potential treatment effects across groups.

From the developmental perspective, researchers believe that phonological coding and orthographic processing skills are critical in early reading development but not in skilled reading and spelling activities, especially in normal developed adults (Frith, 1985). For reading and spelling skills, most research pays more attention to advanced English literacy skills that are related to reading, writing, speaking and listening (Scarcella, 2002). Therefore, the study conducted with monolingual adults aimed to investigate the effectiveness of cognitive-linguistic skills on reading and spelling abilities is sparse.

3.1.7 The effects of orthographic and phonological training on English word spelling for ELLs

Based on the universal phonological principle (UPP), for all orthographies, phonological processing will be activated for skilled readers to complete word reading activities (Perfetti & Liu, 2005). For ELLs, phonological awareness is also a key factor in successful reading and

spelling in English. Specifically, like English monolingual children, phonological awareness is believed to be the most important cognitive-linguistic skill for the English acquisition process of ELL adults (Wagner et al., 1994; Baddeley et al., 1998). Compared to the acquisition of L1, when learning English as a second or additional language, the English learning process requires more cognitive resources. Therefore, English phonological awareness plays a more important role in reading and spelling of ELLs. In this way, they could be able to store the text in their working memory for further decoding and comprehension (Alhazmi & Milton, 2015).

In order to improve the ELLs literacy skills, researchers proposed that phonological intervention could significantly improve the knowledge of grapheme-phoneme correspondence of ELLs, but the intervention needs to incorporate extensively classroom activities (Torgesen, 2000). However, most of these empirical studies were conducted with pre-school learners and young children. Lesaux and Siegel (2003) illustrated that ELL children from different language backgrounds could still perform as good as English monolingual children in the word reading task after receiving phonological instruction in kindergarten for one year. San Francisco et al. (2006) found a mutual relationship between English phonological awareness and the overall level of English proficiency of ELLs. They indicated that when ELLs have sufficient English lexical items, they would be able to generate analysable phonological knowledge with intensive exposure to the English language. Nonetheless whether English monolingual children need and when they need phonological training to strengthen their development of early literacy skills, it is reasonable to propose that ELLs with insufficient English literacy skills should be provided with phonological training as soon as possible.

After identifying the necessity of providing ELLs phonological awareness to support their English acquisition process, the effectiveness of the intervention programmes conducted with ELLs will be discussed next.

Ludwig et al.,(2019) conducted a meta-analysis with 26 intervention studies that were conducted with ELLs to examine the effectiveness of reading interventions on improving the English reading skills of ELLs. Large effect sizes were reported for reading accuracy (d = 1.22) and reading fluency (d = 0.80); for reading comprehension the effect size was moderate (d = 0.50). Ludwig and his colleagues indicated that ELLs would benefit more from the intervention programmes on their word reading accuracy with a small group size (two to five students). In addition, they also found that the key components of interventions (phonological awareness, vocabulary, reading fluency) that worked effectively for English monolingual children are also effective for ELLs or even more effective for ELLs. However, the effectiveness of the intervention programmes would be varied depending on the design of the intervention itself (e.g., group size, type of intervention, duration of intervention, students' language background).

Previous studies found that English reading skill has a positive influence on ELLs spelling ability and vice versa (e.g., Abbott et al., 2010; Lerkkanen et al., 2004, Pinto et al., 2015). It would be ideal that if the study focuses on the training of spelling skills, the reading skills of individuals could also be improved.

Shanahan and Beck (2006), on the NLP report, mentioned that they found "no studies of instruction in spelling or sight vocabulary for language minority students" (p. 419). Instead, they analysed five studies on phonological awareness and phonics instructions for reading development and considered the NRP's report (2000) involving English native speakers. Shanahan and Beck underlined that phonological awareness and phonics instructions benefit the reading development of ELLs just as those for native English speakers. They also reviewed three experimental studies on English vocabulary instruction for ELLs yielding the same findings consistent with native English speakers as reviewed by the NRP.

Cirino et al. (2009) examined one-year follow-up outcomes of Spanish and English interventions for ELLs at risk for reading problems. They incorporated phonemic awareness and phonics instructions as the intervention in both English and Spanish languages. The activities included in both interventions were phonemic awareness, letter-sound correspondences, word recognition reading fluency. After receiving 120 sessions of intervention (40 minutes per session) within one year, they found that the intensive intervention programmes have led to sustained gains in phonological awareness, spelling accuracy, reading fluency, and reading comprehension regardless of whether the intervention was delivered in Spanish or English. These gains were still maintained one year after the intervention terminated. However, no transfer effect was found in the other language even the transfer effects were found between English and Spanish in previous studies (Carlisle & Beeman, 2000; Proctor et al., 2005).

The work of Gonzalez-Bueno and Shaw (2011) examining the effect of a 20-session intervention focused on teaching the target sounds /d/ and / ð/, which are two confusing sounds for Spanish ELL speakers, to Year 3 Spanish-L1 children. Under the notion of auditory, grapheme, and phonics training, significant improvement was found on word spelling ability when the target sound was in the initial position but not when the target sound was in medial or final position. This study suggested that "students become successful when teachers provide explicit instruction through auditory and grapheme training focuses on unfamiliar sounds in the foreign language" (p. 1199). However, the intervention only included 20 sessions, and each session only lasted for 15-minute, which is relatively short. This might be the plausible reason that Spanish ELL children could only discriminate and identify the target sounds in the initial position rather than in the medial and final position. Therefore, further study should be conducted to investigate the effectiveness of intervention study focusing on the English sounds that ELLs might be unfamiliar with or have difficulties with reading and spelling.

In addition to phonological awareness and phonics interventions, two studies focused on vocabulary. Vadasy and Sanders (2015) conducted studies on the effect of spelling and active pronunciation in learning difficult vocabulary during story reading. The participants were 72 low-skilled kindergarten ELLs. The participants received 5-10 minutes of individual intervention every day for six consecutive days. The tutor read aloud a total of six different stories read in six days with 16 difficult target words selected from various sources. Four measures of early literacy skills were used to assess the effect of the intervention: expressive vocabulary (pre-test only), receptive vocabulary, vocabulary definition, and spelling. This study found that there were significant positive effects on the three measures: receptive vocabulary, vocabulary definition, and spelling. Focusing on spelling, Vadasy and Sanders (2015) found that neither spelling gains nor its interaction with condition significantly predicted gains in receptive vocabulary or vocabulary definition. The plausible reason might be that the intervention programmes only contained limited incidental alphabet instruction, which is not sufficient enough to help these ELL children with limited alphabet knowledge "catch up". A weak foundation of alphabet knowledge further restricted children's potential to improve on the tasks that require children to build the connections among semantic, orthographic and phonological information.

In another study, Vadasy and Sanders (2016) examined the effect of connecting meaning, speech, and print on vocabulary learning of 116 kindergarten ELLs came from a variety of language background including: Asian, Spanish, Ukrainian, Arabic and African. The participants were randomly assigned to two groups intervention conditions: explicit vocabulary condition (EV) and explicit vocabulary with added spelling condition (EV-S). After receiving individual vocabulary intervention for four days per week for 14 weeks (15 minutes a day), the participants were tested on general vocabulary, general word reading, general spelling, taught word learning, and taught word spelling. This study found that both groups made significant gains on the post-test and that children in EV-S had greater gains in the general vocabulary, general word reading, and spelling than the EV children. Even the benefits of the intervention were identified, the study was conducted with primary school ELL students with limited English proficiency but without an untreated

control group, which might become concerns of the generalisability of the findings as it would be hard to make a firm conclusion whether the gains are caused by the intervention programmes or by the regular classroom instruction.

The findings from previous studies confirmed the effectiveness of phonological awareness intervention on improving ELLs English acquisition process; however, most of these studies were conducted with ELL children with or without learning difficulties. In addition, most of these studies were conducted with children from an alphabetic language background or included a variety of language backgrounds. The scant evidence was found on ELL adults' learning process. Therefore, the effectiveness of intervention studies successfully conducted with ELL children on ELL adults, especially ELL adults from a logographic language background, still remains unclear. After reviewing the existing literature, little is known about the factors that are critical for the acquisition of English literacy skills of adult ELLs and how to facilitate the acquisition process. The current study is going to fill this research gap.

3.1.8 The effects of orthographic and phonological training on English word spelling for Chinese ELLs

As indicated in cross-cultural studies, cognitive skills that are essential for individuals first language could transfer to their second or additional language learning, even the linguistic distance is high such as Chinese and English (Yang, Cooc & Sheng, 2017). This is confirmed by Chen and Hsieh (2011). They found that, in order to learn new English words, Chinese ELL students would only pay attention to the spelling and meaning of the word but ignore the sounds. Chinese students, thus, do not really know how to guess the sounds based on the written form. For adult Chinese ELLs, they would emphasise meaning-oriented strategies in their English learning, especially vocabulary learning, which might be the reason for the significantly lower performance of Chinese ELLs on phonological awareness compared to their English-L1 peers (Gu & Johnson, 1996).

As mentioned earlier, phonological awareness, especially phoneme awareness, would not be acquired naturally unless the learners have been taught (Kruidenier, 2002). In China, it would be really hard for both Chinese ELL children and adults to develop English phonological skills due to the linguistic and educational environments. Whereas, the converging evidence in the literature has demonstrated the critical role of phonological awareness in the early development of English reading and spelling of Chinese ELL learners (McBride-Chang & Treiman, 2003; Keung & Ho, 2009; Cheung et al., 2010). Moreover, Schmitt (2000) suggested that the acquisition of English reading and spelling should be similar for both English native speakers and ELL learners. That is, for the English monolinguals who already have a large amount of speech-language still need specific phonological training to reinforce their phonological awareness to achieve advanced English learning, there is no reason why ELLs with limited English literacy skills should not be provided with phonological training to improve their English language skills (Yeung et al., 2013).

Similar to English monolingual children, the studies conducted with Chinese ELL learners found the vital role of phonological awareness in their English reading and spelling abilities (e.g., Yan et al. 2007; Chien et al., 2008). In addition, English phonological awareness is a significant predictor of Chinese phonological awareness and vice versa (Cheung et al., 2010; Chow, 2014). Furthermore, the effects of English phonological awareness instruction were identified on facilitating ELL children's acquisition of English reading and spelling. Nevertheless, as aforementioned, the generalisability of effective intervention that successfully conducted with ELLs from alphabetic language backgrounds to Chinese ELL children and adults is still unclear as the investigation of effects of English phonological training on Chinese ELLs' English literacy skills is rare and mainly focus on English reading and spelling skills of children, especially Cantonese-L1 children from Hong Kong. As children from Hong Kong acquired Chinese without assistance from the alphabetic script, their phonological awareness skills are significantly lower than their peers from mainland

China. Therefore, more research would be needed to examine the effectiveness of potential effective instructions on enhancing English learning for Mandarin-L1 ELLs.

Sun et al. (2013) conducted a longitudinal study with first-grade Mandarin-L1 children from Taiwan. They found that, after implementation of training that systematically taught English phonological awareness (from syllable to phoneme), their English word reading and spelling performance were improved significantly. In addition, the training effects were maintained six and twelve months after the termination of the intervention. However, they only included a pseudoword reading task, which predominantly relies on phonological decoding. And the spelling task included in this invention was a match to the trained words (e.g., bell vs hell), which also rely on phonological awareness. Whether the effects of this training programme could be generalised to general word reading and spelling abilities is unknown. Further research, hence, should include general word reading and spelling tasks to examine if the training programme is effective on enhance English literacy skills in general.

Li and Chen (2016) also conducted a study with ELL children from Taiwan. But they only examined the effectiveness of English phonological and morphological interventions on English reading performance. The training included 12 weekly sessions and each session lasted for 40 minutes. The increased performance of both groups on real word and pseudoword reading tasks was found; however, only the improvement made by the phonological training programme reached statistical significance. This might be because, in the current English education in Taiwan, regular phonics teaching is compulsory in Taiwanese children's English classes. With the supplementary phonological training, these children could further consolidate their phonological skills and use these skills in English reading activities. However, the morphological group did not receive extra explicit instruction on phonological skills. As these children were still at the beginning level of English proficiency, phonological awareness rather than morphological awareness plays a more important role in their English acquisition process, as stated in the Stage Theory of

reading and spelling development (Ehri, 2005). When these children reach a higher English proficiency level (e.g., progressing to the consolidated alphabetic phase), they might benefit more from morphological intervention as morphological awareness is the pivotal skill in English reading ability. Li and Chen only examined the effects of phonological and morphological interventions on the English reading ability of Taiwanese children. As there is a mutual relationship between spelling and reading ability (Huang & Hanley, 1995), further research could also investigate whether the interventions that successfully improved the English reading ability of Mandarin-L1 children could also improve their English spelling ability.

For these two studies, the participants were all ELLs from Taiwan. Unlike mainland China using simplified Chinese and Pinyin as the alphabetic script, children from Taiwan use traditional Chinese and Zhuyin as the alphabetic script to facilitate initial Chinese learning. Similar to Children from Hong Kong, Taiwanese children have to deal with visually more complex written language in the Chinese acquisition process. However, similar to children from mainland China, Taiwanese children could use the alphabetic script to facilitate their Chinese acquisition process (Li & Chen, 2016). Even Zhuyin is not a Latin script and requires extra memorisation of symbol-sound correspondence. Therefore, whether the results of the studies conducted with Taiwanese children can be replicated in Mandarin-L1 ELLs need to be investigated.

One more intervention study was conducted with Chinese-L1 children to examine the effectiveness of a 12-week English phonological awareness intervention programme (Yeung, Siegel & Chan, 2013). In each session, young ELL children were taught the target vocabulary in the meaningful text and simple sentences first. Once they understood the words, they would receive systematically training on English phonological awareness. Then, they were instructed to complete picture-naming activities to practice the words they have learned. After the completion of the intervention, significant improvements in English phonological awareness, reading and spelling were found. In this study, children

were taught explicitly and directly, indicating intentional learning was beneficial for Hong Kong ELL children' English literacy skills. However, this study only adopted an intentional learning approach. The further study could further examine the effectiveness of the incidental learning approach as the words learnt incidentally could be used more actively and retained in the cognitive process longer (Webb, 2008). Not many studies have compared the efficacy of intentional and incidental instructions on English vocabulary learning through English spelling with Chinese-L1 ELLs. In this way, a more holistic picture of how to instruct Chinese-L1 ELLs more effectively in their L2 learning process could be understood by both researchers and practitioners. The understanding of effective strategies for vocabulary learning of Chinese ELLs and of the learning strategies that they could benefit more from could further contribute to developing better vocabulary learning intervention and English curriculum. That is because the more the learners engage and enjoy the learning process, the more likely they are willing to actively learn English (Schmitt, 2007).

3.1.9 The current study

As for Chinese adults who receive higher education in the UK, they need extensive independent reading of the materials related to their course (e.g., journals, textbooks, supplemental videos) in English to complete independent study. therefore, they need to have a large academic vocabulary size to support their comprehension of these academic materials to complete discipline-specific study (Dang & Webb, 2014).

For university students, a large portion of their vocabulary that are newly required as academic words. Academic vocabulary is the key component of ELLs academic success. Therefore, the intervention study aims to support academic word learning would be meaningful as it is important to grow vocabulary lexicon on the academic study (Milton & Treffers-Daller, 2013). However, compared to their English-L1 peers, many Chinese ELLs encounter problems in both phoneme-grapheme correspondence and grapheme-

phoneme correspondence in English acquisition process. From this aspect, explicit training should be provided to help them to achieve English competence.

During the acquisition of Chinese process, learners were encouraged to use the "look and say" method (Holm & Dodd, 1996). That is, learners will rely predominantly on rote memory for Chinese reading and spelling. When it turns to the English acquisition process, Chinese speakers would not pay much attention to sound-letter correspondence. The plausible reason is that the simper phonological system of Chinese language and the absence of systematically explicit teaching on the English phonological system, which would lead to Chinese ELLs only developed limited phonological awareness in English. McBride-Chang and her colleagues found that, compared to English native speakers, Chinese ESL children have poorer phonological awareness even their English proficiency levels were comparable. However, phonological awareness in both Mandarin/Cantonese and English among ESL children from Mainland China and Hong Kong still plays a significant role in reading and spelling abilities in both languages (McBride-Chang et al., 2004). As indicated in the previous review, English phonological awareness instruction, especially at the phoneme level, has been found as an effective method to facilitate long-term reading achievement for Chinese ELLs (Li & Chen, 2016; Yeung et al., 2013).

On the other hand, empirical evidence suggests that the mnemonics technique could significantly improve the effectiveness of vocabulary learning and literacy skills of ELL children and adults (Shapiro & Waters, 2005; Mokhtar et al., 2017). As a logographic language, Chinese characters could be related and memorised via visual imageries. Therefore, mnemonics might be a familiar technique for Chinese individuals during their Chinese acquisition process. Holm and Dodd (1996) suggested that the Chinese ELL learners might prefer to use imagery strategy than phonological decoding strategy in learning English vocabulary as it is more optimal and efficient for them. Therefore, they carried more efficient strategies for the acquisition of their first language to their English learning.

From this aspect, different approaches that might accelerate Chinese adult ELLs' acquisition processes of reading and spelling and vocabulary learning process need to be examined. Once they achieved a certain English competence level, we believe that students will start to enjoy reading and spelling as these tasks will be easier to accomplish, which could further enhance ELLs' English proficiency. It could further boost ELLs' self-confidence and academic performance.

We, therefore, designed two intervention programmes to improve Mandarin-L1 university students' academic word spelling performance through explicit instruction about English phonological awareness adapted from Jolly Phonics (Jolly Learning, 2018) and through orthographic knowledge training incorporated with the mnemonic method. The detailed descriptions of these two intervention programmes will be provided in the following section. We expected these two intervention programmes could be effective for Mandarin-L1 ELLs, which could provide some guidance for both researchers and practitioners on enhancing ELL adults' literacy skills.

3.2 Purpose of Study 2

As our review above has shown, the inadequate instruction and experience, which could lead to English reading and spelling difficulties for both ELL children and adults, were identified in English education in China and from the learning experience of Mandarin-English ELLs. Study 2 aimed to further expand upon existing research on academic-oriented English intervention programmes for ELLs, especially for Mandarin-English ELLs at the tertiary level.

After an overview of relevant literature, the following research gaps were identified: 1) existing literature has mainly focused on the effectiveness of interventions aiming to enhance English language skills (e.g., reading, spelling) for Cantonese-English bilingual children from Hong Kong and/or bilingual children with dyslexia, neglecting the situation with adult ELL learners receiving higher education in English-speaking countries; 2) phonological training studies mainly focus on English reading comprehension and English proficiency aspects, while few studies have examined the training effect of phonological structure on spelling; 3) studies on the training effects on English language skills have not explicitly compared interventions that adopt different instruction methods. Research should be done to address the needs of these ELLs.

For ELL learners whose native language is Mandarin Chinese, their English phonological awareness is often weaker than ELL learners from alphabetic language backgrounds (Bialystok et al., 2003). This is because, as a logographic language, Chinese language requires learners to be able to map the meaning of the character to its graphic information directly. Even though phonological awareness and orthographic knowledge have been identified as influential factors in Chinese acquisition (McBride-Chang et al., 2006; Yeong et al., 2014), the Chinese ELLs are prone to rely more on visual skills to read and spell English words because their experience of Chinese language acquisition might make the visual strategy more optimal than phonological decoding strategy (Holm & Dodd, 1996). However, from the results of Study 1, we found that adult Chinese ELLs would employ both phonological skills and orthographic knowledge to accomplish reading and spelling tasks for both real words and pseudowords, and phonological awareness was the strongest predictor for these activities. It remains unclear whether two intervention programmes, one with a focus on the phonological structure of English and one with a focus on orthographic knowledge, could facilitate vocabulary acquisition and word spelling ability for Chinese ELLs.

Therefore, we designed two interventions focus on phonological awareness and orthographic knowledge respectively and then delivered to Chinese ELLs who were receiving higher education in the UK. We also included a control group that enables us to examine whether the potential training effects is caused by the intervention programmes rather than the English-taught courses they received in the university. The study 2 was designed in order to answer the two research questions:

1. Would phonological and orthographic intervention programmes facilitate Mandarin-speaking ELL adults' English reading and spelling abilities?

   Previous research (Li & Chen, 2016; Sun et al., 2013) found that Chinese-L1 children who received phonological training showed a significant improvement on pseudoword than on real word reading. We, therefore, hypothesised that ELL adults who received phonological training could improve significantly in pseudoword spelling tasks, as phonological awareness is the fundamental skill for decoding unfamiliar words, but not in the English orthographic knowledge training group. We also hypothesised that adults received training in orthographic knowledge would perform better in spelling trained words because they might transfer the visual analytic strategy from L1 to L2 to facilitate new word learning.

   In addition, a generalisation effect was found from spelling intervention to single word reading performance (Conrad, 2008; Kohnen et al., 2008; Kohne et al., 2010). We would, hence, expect that ELL adults could achieve improvements in reading tasks if they made significant changes after the implementation of the intervention programmes.

2. Would Chinese ELL adults benefit most from training focused on the phonological skills, the core strategy for learning to read and spell in English, or training focused on orthographic knowledge, the core strategy for the acquisition of Chinese?

Chinese ELLs performed significant lower than their English monolingual peers as shown in Study 1 and previous research evidence (Cantoness-English ELLs: McBride-Chang et al., 2006; Mandarin-English ELLs: Yeong et al., 2017) due to the logographic nature of Chinese and little exposure to English phonological knowledge in their English acquisition process. We hypothesised ELL adults who received phonological training would perform better on phonological tasks and pseudoword reading and spelling tasks than the orthographic intervention group and the control group as phonological awareness is the vital skill to read out and spell pseudowords than real words (Li and Chen, 2016). Moreover, the orthographic group was expected to gain more on English orthographic knowledge compare to the other two groups.

We expected the control group would make little improvement on reading, spelling and other cognitive-linguistic skills, as the classes they attended in the university focus more on specific knowledge that related to their subject area and on English comprehension.

3.3 Development of the intervention programme

Ehri (2000) indicated that as spelling requires pretty much the same fundamental knowledge as decoding activity, researchers have integrated spelling instruction with decoding instructions in various ways. These approaches included whole-word study, invented spelling in the whole language, structured remedial approaches (Clarke, 1988; Bear et al., 2008; Wilson, 2004). Spelling requires extra attention to all the letters and patterns in words that different metalinguistic skills are involved in spelling activities (Alghamdi, 2019). As phonological awareness and orthographic knowledge are two of the predominant skills for successful spelling, the current study developed two intervention programmes focused on these two skills to help university students decode and spell academic words more accurately and fluently. The design of the intervention programmes was based on a theoretical framework and on the design of studies conducted in children

sample as limited studies conducted with international university students. The development of the content of the intervention programmes will be provided below.

3.3.1 Theoretical framework

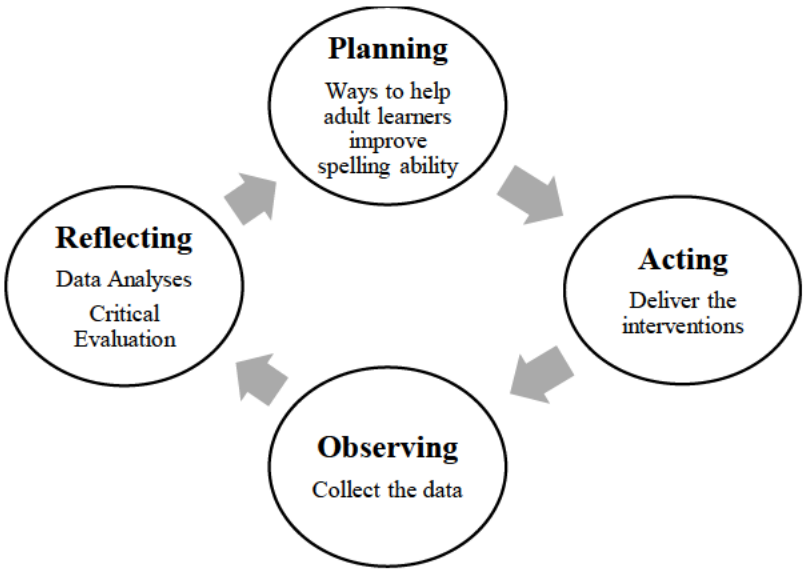
The two intervention programmes were developed and delivered by the current researchers. In order to develop more reactive and reflective intervention programmes and help students be better learners, the action research method was employed in the current study (Mills, 2003). Action research is often described as being cyclical, participative, qualitative, reflective and responsive (Dick, 1993). McCutcheon and Jung (1990) regard action research as a systemic inquiry that is collective, collaborative, self-reflective, critical and undertaken by participants in the inquiry. These two definitions lean more on the problem-solving practical concerns that need quick and immediate remediation and action research render itself well to this study focus. Action research is defined as

> a form of self-reflective enquiry undertaken by participants in social situations in order to improve the rationality and justice of their own practices, their understanding of these practices, and the situations in which the practices are carried out (Carr & Kemmis, 1986: 5).

The four steps model of action research: Planning, Acting, Observing and Reflecting- is one of the classic representations of educational action research (see Figure 3.2; Kemmis & Grundy, 1997). These four steps could be cyclically repeated as long as necessary until the identified problem has been changed or improved were adopted in the current study. In each cycle, researchers and teachers could observe the classroom practices and evaluate the outcomes of the plan. After that, based on the reflection of the practices, the problems in the plan could be identified and suggestions for further improvement could

be proposed. By employing the action research method, teachers and researchers can improve the quality of their teaching practice and can better evaluate their students' learning (Mills, 2003).

Figure 3.1. The Action Research Model (adapted from Kemmis & Grundy, 1997).



In the current research, both phonological training and orthographic training are aimed at improving the academic vocabulary spelling ability of adult EFLs. The development of these two interventions followed the four stages of action research. During the planning phase, based on the review of empirical studies, the designs of interventions were proposed. The delivery of interventions was described in detail in the action phase. During the observation phase, the procedure of conducting the interventions was described clearly. Based on the analyses of the data, the effectiveness of both interventions would be critically evaluated. In addition, the limitations of the current study would be proposed and suggestions for further research would be given at the end of the thesis.

3.3.2 Selection of target vocabulary

As indicated by previous research (Morris & Cobb, 2004), the breadth and depth of academic word knowledge is a key factor in academic success. Unlike the spelling tasks were used in the current study, the AWL would be a more appropriate way to assess the academic vocabulary knowledge of the participants because their daily activities are more academic-oriented. In addition, the intervention programmes that focus on improving academic words would be more appealing for university students as the words could better support their tertiary level study (Coxhead, 2000).

As the current intervention programme was academic-oriented, the target words were selected from the Academic Word List (hereafter AWL; Coxhead 2000). This is because the AWL was developed from a corpus of 3.5 million words of academic texts, that account for approximately 10.0% of the total words in academic texts from various subject areas (e.g., Arts, Commerce, Law and Science) but occur more rarely in oral conversation and narrative texts. Since the current intervention programme was not designed for any particular disciplines, we decided to focus on general academic words as these words appeared across all subject areas with high frequency (Coxhead, 2000). In this way, we could better support university students from different faculties by teaching them the most worth learning words for academic purposes.

To ensure the intervention was authentic, meaningful and engaging, not all of 570 words in the AWL would be taught. As a word enrichment programme, we need to guarantee that the target words are not what the participants have already known. Therefore, at the first stage of developing the intervention, six participants were recruited for a pilot study. They were asked to tick the words in the AWL if they know the meaning of the words. The participants included in the pilot study were from different faculties (two from Faculty of Business and Law, two from Faculty of Health and Life Science, one from Faculty of Engineering, Environment and Computing, and one from Faculty of Art and Humanities) at

different levels of study (two at undergraduate level, two at postgraduate level and two at doctoral level).

From the results of the pilot study, 122 words that three out of six participants do not know the meaning were selected as target words. Two words were removed because they are included in WRAT-4. Then, the 120 words were randomly divided into two groups: one group was used for training purposes and another group was used to assess if the interventions could result in generalisation to untrained words. In addition, the two sets of words were matched on psycholinguistic variables: word frequency, the number of letters, the number of syllables, the number of phonemes and orthographic neighbourhood size, using the software N-Watch (Davis, 2005).

Gierut et al. (2010) further indicated that pseudowords are more effective in phonological treatment than known words. Cummings and Barlow (2011) found that, compared to the intervention programme using real words, the pseudoword condition intervention was more effective in helping children learn the sound structure of English words, which could further facilitate real word learning, because the influence of lexicality was isolated. As the phonological intervention in the current project focused more on teaching the English phonological system, we decided to use pseudowords in this group to let the learners study the nature of phonological assembly in its purest form. Therefore, 60 training words from the AWL were transformed into pseudowords by using the pseudoword generator, Wuggy, which could generate multisyllabic words (Keuleers & Brysbaert, 2010). The pseudowords set and real word set were matched in the length of the sub-syllabic structure, letter length and transition frequencies (concentric search). In addition, the pseudowords also matched 2 out of 3 sub-syllabic segments to the real words, which is an ideal ratio for the pseudowords to be very wordlike but are not easily identifiable as related to an existing word (Keuleers & Brysbaert 2010).

The 60 real words were used in the teaching for the orthographic intervention group and the 60 pseudowords were used for the phonological intervention group. In addition, another 60 real words were used as generalisation probes.

3.3.3 Design of intervention programme

The development of the intervention programme requires decisions related to instructional delivery and instructor development to ensure the quality of instructions. The effectiveness of the intervention program is likely to be determined by factors beyond the control of teaching strategies and teaching materials (e.g., teachers, class size and language of instruction; Cheung & Slavin, 2005).

Firstly, instruction was designed to use both Mandarin and English. Empirical evidence indicated that the intervention programmes for adult EFLs would be more effective if the interventions are delivered in both their native language and English rather than English-only (Greene, 1997; Slavin & Cheung, 2005; Li, 2018). However, other research on the language of instruction indicated that if the intervention programmes involve L1 instruction, it will probably delay English language development, which will make the programmes less effective (Rossell & Baker, 1996). In order to compare the effectiveness of language of instruction, Rolstad et al. (2005) conducted a meta-analysis based on 17 studies. They found that intervention programmes with instructions on both L1 and L2 have a positive effect of .23 standard deviations. Furthermore, they also found that by using both L1 and L2 as instructional languages, the interventions are effective in promoting academic achievement and enhancing literacy skills in both languages; although some studies, contradicted to this argument, insisted that English-only programmes could serve EFLs better (see meta-analysis: Rossell & Baker, 1996). Li (2018) conducted an interview after the intervention programme that indicated students preferred an equal distribution (50:50 ratio) of L1 and L2 across the whole programme. The students suggested that instruction in their native language could make sure the majority of the

class could understand the core contents of the programmes and further the 50:50 ratio would be the balanced ratio for the whole class to benefit from the bilingual setting. Based on the empirical evidence, the current intervention would use both Mandarin Chinese, which is the native language of the participants of the present study and English as the instruction language. There are some group activities, and instructors supported learners in individual application of the content and strategy during the rest of the class time in Mandarin if the individuals had difficulties in completing the activities, but the core instruction was delivered to groups in English.

Secondly, it is necessary to consider sample size, because it is important for the calculation of weighted effect sizes (Suggate, 2016). The instruction was designed primarily as small group instruction. Previous meta-analyses investigated the effect of instructional conditions on the different English interventions in terms of group size (e.g., Ehri et al., 2001; Wanzek & Vaughn, 2007). Ehri et al. (2001) indicated that small group size (9 to 22 students) was the most effective way to deliver instruction (d = 1.37) than large-group and one-to-one tutoring interventions (d = .53 to 1.10). However, Ludwig et al. (2019) found that the intervention groups with two to five students were more effective than groups with more than five students. Although the role of group size is still controversial, the studies included in these meta-analyses were conducted with primary school students. As most interventions with EFLs focused on literacy skills occurred in small groups or individualized settings compared to work with general education students occurring in larger, classroom-sized groups, findings suggest instruction is most effective when unit size is designed around the needs of students who are receiving the instruction (Goodwin & Ahn, 2013, p. 263). In the current study, we decided to conduct the interventions in small groups as suggested by Baker-Smemoe et al. (2014). As the participants are adults, their initiative is higher than children. The instructor only needs to support them when they confront with difficulties, which allow the group size could be slightly larger than the optimal group size for children. From this aspect, the interventions were conducted with a sample size of 15 per group.

Thirdly, the intervention length is also needed to be considered when designing the intervention. It is commonly believed that the longer the intervention lasts, the more improvements individuals will make. However, from previous meta-analyses, the length of intervention did not seem to be directly related to the effectiveness of intervention programmes for both EFLs and English native speakers (Ehri et al., 2001; Snyder et al., 2017). Analysis of outcomes of different intervention programmes found that studies that have large effect sizes (*d* = 1.14 to 1.37) lasted from 5 to 18 hours and the length of these programmes ranged from 5 to 72 weeks. These findings indicated that high-quality interventions that last a relatively short period of time would be beneficial to individuals. Based on the research evidence, the 60 words that we selected for the current intervention programmes were divided into 12 intervention sessions and each session lasted for one hour. Moreover, fluency in reading and spelling tend to lag behind the development of accurate decoding and require a lot of practice. Empirical evidence revealed that timing adults' reading and spelling activities led them to sacrifice accuracy for speed (Kuhn & Stahl, 2003). Thus, during the intervention, participants were encouraged to practice and complete the tasks without time limits. In addition, in order to give participants sufficient time to practice the decoding skills, only 5 words were included in each lesson.

Acting and observing

The phonological awareness group received the intervention that focus on the explicit understanding of phonological rules and spelling rules in English by using pseudowords that were generated based on the academic words. For the orthographic group, they were taught the academic words with emphasis on the whole word recognition and the meaning of the word. For the control group, they only received regular classes in English in the university without intervention. The detailed description of the two interventions will be discussed in the following section.

Each lesson began with a dictation of the five words that would be taught in the lesson was conducted. Based on the results of dictation, participants would have a chance to identify their weaknesses, which could help them focus more on specific decoding skills throughout the lessons. In addition, a flexible and strategic approach for decoding could get learners to pay attention to word structure so that they can extend their knowledge through reading and spelling after the intervention (Juel & Minden-Cupp, 2000). Skills, moreover, that could help learners to develop independence in applying knowledge to meaningful tasks could motivate learners to engage more in the class (Graham, 2006). The intervention programmes emphasised the importance of flexibility in applying the strategy. Thus, comprehensive metacognitive strategies for decoding multisyllabic words were modelled and practised in various tasks throughout the intervention. The researcher also encouraged learners to apply these strategies during their academic activities.

Phonological training program

We adopted the concept of phonological awareness in a sense of phonological linkage hypothesis by integrating phonological awareness training with spelling instruction together. There are 44 phonemes in spoken English; however, it is not realistic to teach every single phoneme during the intervention due to the limited teaching time. The intervention focused on teaching phonemes that Chinese ELLs made the most mistakes. As reviewed in the previous chapter, vowels and diphthongs are particularly difficult for Chinese ELLs (Ehrlich & Avery, 2013). These two types of phonics were taught systematically in the current intervention programme. In addition, the consonants /r/, /w/, /v/, /θ/ and /ð/ were also included in the explicit instruction. In order to better illustrate how and where the sound is made, the videos in the Sounds of English series from BBC Learning English were used to show the participants the shape of lips, the position of the teeth and the place and manner of articulation (BBC, 2014).

In the first session, the links between sounds and spelling alternatives were introduced to the participants by using the English Alphabetic Code from Jolly Phonics to help them develop a basic understanding of sounds and spelling (Jolly Learning, 2018). Although, in this chart, not all exceptional spellings were provided as English is a very inconsistent language, the participants were still encouraged to practice spellings using the chart as it provides the most common spellings.

In each session, the researcher presented the target phoneme with the correspondent video first and the participants were required to repeat the phoneme. The researcher was monitoring their progress during the listen-and-repeat phase and gave immediate feedback. The participants were then asked to work in pairs using the alphabet flashcards to complete the given activities. The activities involved in the intervention were adopted from Sound Linkage Programme (Hatcher et al., 2014). Because the purpose of the current study aimed to teach phonological structure systematically, the practice exercises included the activities of counting (e.g., five phonemes in *domail*, the pseudoword generated from the word *domain*, or two syllables in *domail*), blending (e.g., /d/,/əʊ/,/m/,/eɪ/,/l/ into/dəʊmeɪl/), segmenting (e.g.,/dəʊ/ into /d/ and /əʊ/), deleting (e.g.,/meɪl/ into /eɪl/ by deleting the first phoneme), substituting (e.g., /dəʊmeɪl/ into /dəʊmeɪn/ by substituting the last phoneme with /n/) and transposing (e.g., /dəʊmeɪl/ and /parəlɛl/ into /pəʊmeɪl/ and /darəlɛl/ by exchange the first sounds of the two words) at syllable and phoneme levels. In addition, as phonological awareness normally develops from learning larger units to smaller units of sound (Ziegler & Goswami, 2005), the participants were required to complete the activities at the syllable level first and then moved to the activities at the phoneme level. After the participants completed all these activities, they were required to write down the target word to dictation again.

Application of new skills to meaningful reading and writing is important at all ages and, perhaps, especially with adult learners (Beder, 2013; Wagner & Venezky, 1999). After completing the activities with pseudowords, the participants were asked to substitute

certain parts in the pseudowords with the phonemes that were presented on the slide, which could turn the pseudoword into the target academic words. The meanings and example sentences containing the target words were presented to the participants. In this way, the participants could reinforce the phonological knowledge they have just learned and also acquire meaningful words that are important in their academic study.

Orthographic training program

For the orthographic group, the mnemonic method was recruited. When adopting this method, some research has claimed that instructor-provided keywords either aid retention more than student-generated keywords (Nanda, 2017), or equally as student-generated keywords (Wei, 2015), however, research on this method has produced mixed results (Sagarra & Alba, 2006). According to the previous intervention studies, if learners are more engaged and motivated in the intervention, they could learn more vocabulary (Alghamdi, 2019). From this aspect, rather than letting students to memorise the visual information provided by the instructor, they were encouraged to generate their own interactive images to better support their understanding of the target words.

At the beginning of each session, two pictures were provided as examples of visualising the keywords (see Figure 3.3). During the training sessions, the target word was presented on a presentation slide with the meaning of the word, which was in italics, and a sentence relating the word. The definitions of the target words and example sentences were obtained from Cambridge Dictionary (Cambridge University Press, 2018), and the keyword was in bold text in the example sentences. In addition, definitions and example sentences that are suitable for university students were selected.

Figure 3.2. Examples of pictures with embedded words (adjacent and consent) used for the visual imagery technique.

The researcher first presented the target word on the slide. Then, the pronunciation of the word was played, and the participants were required to read aloud the word three times. The researcher would evaluate the participants' performance to decide if further practice of the pronunciation was needed. Third, the researcher provided the meaning and example sentence containing the target word to the participants. The participants were encouraged to read the meaning of the target word in English. If they met difficulties in understanding English meaning, the researcher would explain the word in Mandarin to make sure they fully understand the word. Fourth, the researcher instructed the participants to create an interactive image of the word based either on the pronunciation or the meaning of the word (either English or Chinese or both) and to draw it on an A4 paper. After they completed the drawing, they were asked to memorise the spelling based on the image they created and read out the word at the same time. Then they were required to write the word to dictation again without seeing the picture.

Control group

The control group received normal university teaching without any supplementary training on phonological awareness or orthographic knowledge.

3.4 Participants

A total of 45 university students (25 males, 20 females) attending a university in England were recruited in Study 2. The mean age of the sample was 25 years (range = 20 years to 30 years; SD= 5.05). All participants were native speakers of Mandarin Chinese and they were screened for eligibility to participate in the intervention programmes aiming at improving English spelling performance. Eligibility criteria were: (1) no exposure to any other languages but Mandarin Chinese prior to age 5; (2) adequate English proficiency by non-native English speakers, which is Band 6 defined as "competent user" or higher on the International English Language Testing System (IELTS) test or had completed pre-sessional English course offered by the university (British Council, 2020); (3) no vision or hearing problems that would markedly interfere with assessment or instruction; and (4) no reported history of services for brain injury or other language disorders that would affect the process of receiving and understanding language. Informed consent was obtained from all individuals after receiving a full explanation of the study's goals and procedures. Participants who were enrolled in the Psychology Faculty were given credits for their participation, which are compulsory for them to get during their undergraduate study.

3.5 Materials

Each participant was given an extensive individual pre- and post-intervention battery to assess single word reading and spelling abilities, related cognitive skills, and educational histories and background differences. The following subset of measures was included in the present analyses.

Non-verbal ability tasks

Matrices. The Matrices test used in Study 2 (subtest of WRIT; Glutting et al., 2000) is identical to that used in Study 1. The description of the test is given in Study 1. In addition,

non-verbal intelligence ability is not supposed to be improved in a short period of time, Matrices test was only assessed before the interventions.

Single word reading and spelling tasks

English word reading and spelling. The Green Form from WRAT-4 (Wilkinson & Robertson, 2006) was used to assess real word reading ability. The pseudoword reading subtest from WIAT-II (Glutting, Adams & Sheslow, 2000) was used to test pseudoword reading ability. As for spelling tasks, the real word spelling test of WIAT-II and the pseudoword subtest from Castles and Coltheart Test 2 (CC2; Castles et al., 2009) were administered to assess English spelling abilities. The detailed descriptions of these four tests are provided in Study 1.

Academic words spelling. In this measure, participants were asked to spell 120 words that were selected from the AWL (Coxhead 2000). The detailed selection process would be described in the following section. For each word, the participants were required to spell the target words based on the meaning as sample sentences were provided. The accuracy and the time to complete the whole task were captured for further analyses.

Phonological Awareness

English Elision. In order to assess participants' ability to manipulate syllables and phonemes, the subtest from CTOPP – 2 (Wagner et al., 2013) was selected, which is identical to that used in Study 1. There were 34 items in total. The accuracy and the time to complete the task were recorded.

Mandarin Elision. The Mandarin version Elision task was adapted from Hamilton (2007), which is identical to that used in Study 1. There were 48 items in total. The accuracy and the time to complete the task were recorded.

The detailed descriptions of English and Mandarin Elision tests are provided in Study 1.

Orthographic processing skill

English Orthographic choice task. 18 pairs of pseudo-words were presented to evaluate the participants' orthographic process skills. The task was adapted from a similar task used by Olson et al. (1989) and it is identical to the task was used in Study 1. The accuracy and the reaction time were recorded.

Chinese Orthographic choice task. 40 pairs of pseudo-characters, which is identical to that used in Study 1, were administered to assess the participants' Chinese orthographic knowledge. The accuracy and the reaction time were recorded.

The detailed descriptions of these two tasks are provided in Study 1.

Visual memory

Design memory. This task was adopted from WRAML 2 (Sheslow & Adams, 2003). The maximum score of this task was 60. Both total raw score and time to completion were recorded. The detailed descriptions of this task are provided in Study 1.

3.6 Procedure

Ethical approval was granted by Coventry University ethics committee. The pilot study was conducted in February 2018. After the participants completed the pilot study, researchers started to design the training materials based on the results of the pilot study, which took place from February to March 2019.

For pre-test, the tests mentioned in the Material section were conducted with the participants. Each participant was assessed in a quiet room for one to one and half hours. Participant Information Letter was given to each participant firstly and then Consent Form was given to make sure that they fully understood the study and the information on the Participant Information Letter. Once they were permitted to take part in the experiment, they signed the Consent Form. After obtaining the consent, participants were recommended to settle themselves comfortably in a chair in front of a laptop. All English audio files of target tasks were made by a native female English speaker and all Mandarin relevant audio files were made by a native female Mandarin speaker. After finishing all tasks, the Debrief Form was given to each participant to increase their further understanding of the study in which she/he was involved. The data collection for pre-test lasted from March to May 2019.

The participants who took part in the pre-test were randomly allocated to the phonological group (n=15), the orthographic group (n=15), and the control group (n=15). In both training conditions - phonological intervention and orthographic intervention – the participants started to receive supplementary training from June to July 2019. Each lesson lasted for one hour with a focus on enhancing students' English spelling ability using academic vocabulary. All participants attended instructional sessions twice weekly for a total of six weeks.

One week after the completion of intervention programmes, post-test was conducted to assess whether the participants made any improvements on literacy skills, and the participants in the control group also came back for post-test. Intelligence ability is generally believed to be stable over time. The non-verbal IQ test, therefore, was not included in the post-test.

3.7 Results

Preliminary Data Analyses

Prior to the data analyses, the English real word and pseudoword reading tasks were scored by a designated research assistant who is a native speaker of English to ensure the data collected from different time points were scored consistently. All other tests were scored and entered by a trained research assistant and all aspects of data scoring were double-checked by the researcher.

Statistical analyses were performed using SPSS 26. A set of preliminary analyses were based on pre- and post-measures of the various cognitive-linguistic measures and the reading and spelling abilities. All data were first screened for the presence of deviations from normality. No significant problems in the data distributions were detected.

For the purpose of evaluating the possible impact of outliers, all scores at least 2 standard deviations above individual variable means were initially considered as potential outliers and removed. We compared the results of analyses using these two databases (with and without the outliers) and no significant differences were detected between the databases. The analyses, therefore, using the original sample are presented in the following sections.

The degrees of skewness and kurtosis were then checked to ensure the data met the normality assumptions. No distributional problems were found by examining the values (skewness < |2| and kurtosis < |7|; Kim, 2013).

Results of the group matching process

Prior to comparing the effects of the intervention programmes, demographic information (age, gender and length of living in the UK), the performance of all cognitive-linguistic measures, reading and spelling abilities of all three groups administrated at pre-intervention and post-intervention are reported in Table 3.1 and Table 3.2.

Table 3.1. Comparison between experimental and control groups on demographic information

Measures	PA Intervention (n = 15)		Orthographic Intervention (n = 15)		Control Group (n = 15)	
	M	*SD*	*M*	*SD*	*M*	*SD*
Age (years)	24.62	4.63	25.80	6.44	24.47	3.93
Length of Staying in the UK (in months)	24.54	28.69	22.57	20.31	23.80	25.37
Non-verbal IQ (raw score)[a]	20.36	4.67	19.13	5.29	18.67	5.21

Note. [a] Matrices' subtest of the WRIT, total correct responses out of 36.

In order to investigate our exploratory research questions, descriptive statistics were generated to check the patterns across each measure for the whole sample by the groups. Preliminary analyses with analysis of variance (ANOVA) indicated that the two groups did not differ in age, $F(2,42) = 0.30$, $p = 0.74$, length of living in the UK, $F(2,39) = 0.22$, $p = 0.98$, gender, $F(2,39) = 0.87$, $p = 0.43$, and non-verbal IQ, $F(2,41) = 0.43$, $p = 0.66$. Also, there was no significant difference in all pre-test scores among the three groups as revealed by the ANOVAs, all ps > 0.09. As participants were randomly allocated to three subgroups, none of the group comparisons reached significance, which indicated good overall matching by condition.

Table 3.2. Descriptive results from all measures by groups.

Measures	PA Intervention (*n* = 15)		Orthographic Intervention (n = 15)		Control Group (n = 15)	
	M	*SD*	*M*	*SD*	*M*	*SD*
Academic Word Spelling						
Trained Words (max = 60)						
Pre-test	10.25	19.74	12.31	19.40	15.35	17.49
Post-test	17.49	16.78	35.83	15.47	16.44	16.78
Untrained Words (max = 20)						
Pre-test	6.48	7.22	8.89	7.59	7.21	6.01
Post-test	10.32	10.30	13.77	11.80	9.76	9.29
Word Reading						
Real word Reading (max = 55)						
Pre-test	27.79	7.21	29.47	7.88	27.80	6.60
Post-test	30.86	7.57	33.53	6.00	28.20	6.06
Pseudoword Reading (max = 57)						
Pre-test	37.07	7.00	37.73	7.15	38.87	10.15
Post-test	45.07	5.27	39.60	7.23	38.73	9.79
Word Spelling						
Real-word Spelling (max = 27)						
Pre-test	6.86	4.20	8.20	5.06	11.40	4.08
Post-test	8.07	3.73	11.33	4.47	11.60	3.31
Pseudoword Spelling (max = 40)						
Pre-test	5.86	3.32	8.40	4.45	9.47	3.44
Post-test	16.21	2.75	13.93	5.30	11.00	3.91
Phonological Awareness						
English Elision (max = 34)						
Pre-test	19.93	6.46	18.67	5.79	23.60	6.14
Post-test	30.57	5.50	28.60	4.12	23.47	6.71
Mandarin Elision (max = 48)						
Pre-test	36.57	4.52	37.87	4.90	39.87	6.21
Post-test	43.21	2.83	40.80	5.77	40.47	5.72
Visual Memory						
Design Memory (max = 48)						
Pre-test	32.57	5.96	33.67	7.42	34.60	6.43
Post-test	33.64	4.83	35.20	6.45	35.07	5.98
Orthographic Knowledge						
English Orthographic knowledge (max = 18)						
Pre-test	15.14	1.35	14.67	1.45	14.33	1.68
Post-test	16.00	0.68	15.33	0.90	14.80	1.52
Mandarin Orthographic knowledge (max = 40)						
Pre-test	37.71	2.81	37.27	3.51	37.67	2.26
Post-test	37.57	2.74	37.40	3.50	37.87	2.39

Intervention effects on phonological awareness, orthographic knowledge, visual memory, reading and spelling abilities

The intervention effects were examined by performing separate Analysis of Covariance (ANCOVA) tests on the measures of reading, spelling and cognitive-linguistic awareness skills, with the intervention group (the phonological intervention, the orthographic

intervention and the control group) as a between-subjects factor, and pre-test scores, age, non-verbal IQ and the length of staying in the UK as covariates. Even phonological awareness and orthographic knowledge of the participants were measured in both English and Mandarin Chinese, which tended to correlate with one another, the measures in two languages were still tested with ANCOVAs separately after considering the dramatic difference between the two languages.

After the ANCOVA tests, the paired-samples t-tests were conducted to further investigate whether there were any differences in the participants' performance on each measure between the pre- and post-intervention time points in each group.

In order to quantify the power of the intervention programmes, the partial eta squared (partial η^2) of significant effects, which measures the proportion of the total variance that is attributable to the main factor or an interaction (Cohen, 1988), were reported. Richardson (2011) indicated that the benchmarks for interpreting effect sizes are small (partial $\eta^2 = 0.01$), medium (partial $\eta^2 = 0.06$) and large (partial $\eta^2 = 0.14$). In the following sections, thus, we employed these benchmarks to interpret the magnitude of the observed effects in our study. In terms of the effect size of paired-samples t-tests, Hedges's *g*s of significant effects were computed and reported due to the small sample size (Lakens, 2013). To interpret the effect sizes of paired-samples t-tests, we adopted the observed effects cut-off points (small: Hedges's $g = 0.2$; medium: Hedges's $g = 0.5$; large: Hedges's $g = 0.8$) that are suggested by Cohen (1988). It is noteworthy that these cut-off point values are arbitrary and should not be interpreted rigidly (Lakens, 2013). However, as mentioned in the previous section, few studies have compared the effectiveness of phonological and orthographic interventions conducted with adult ELLs. It is reasonable to use these benchmarks to explain the practical implications of the observed effects as the findings of the current study are novel and would not be able to compare with previous literature (Fidler, 2002; Plonsky & Oswald, 2014).

Efficacy of the interventions

Table 3.3 displayed the gains that all three group made on all cognitive-linguistic measures, reading and spelling abilities.

For the trained academic word, the results of the ANCOVA test indicated that pre-test score was the only covariate that significantly associated with post-test score, $F(1, 37) = 150.11$, $p < 0.001$, partial $\eta^2 = 0.81$. No significant effect was found between age, $F(1, 37) = 0.09$, $p = 0.76$, non-verbal IQ, $F(1, 37) = 0.06$, $p = 0.81$, the length of staying in the UK, $F(1, 37) = 0.45$, $p = 0.51$. After controlling for all covariates, the main effect of the intervention group on trained academic word spelling was observed, $F(2, 37) = 42.63$, $p < 0.001$, partial $\eta^2 = 0.71$. The post hoc comparisons indicated that the participants in the orthographic group ($M = 35.83$) performed significantly better than those in the phonological group ($M = 18.44$; $p < 0.001$) the control group ($M = 15.49$; $p < 0.001$), after the implementation of the intervention programmes; however, no significant effect was found between the control group and the phonological group ($p = .08$).

From the results of follow-up t-test, compared to participants' pre-test scores, both intervention groups demonstrated significant improvement in the accuracy of the trained words ($t(14) = 7.83$, $p < 0.001$, Hedges's $g = 0.88$ for the orthographic group; $t(14) = 6.13$, $p < 0.01$, Hedges's $g = 0.45$ for the phonological group). The participants in the control group only made little improvement and the effect was not significant, $t(14) = 0.26$, $p = 0.91$.

For the untrained academic words, a similar pattern was found. Only the pre-test score was found to be significantly related to the post-test score, $F(1, 37) = 153.16$, $p < 0.001$, partial $\eta^2 = 0.79$. But for other covariates, no significant effect was found on untrained academic words (for age: $F(1, 37) = 1.52$, $p = 0.62$; for non-verbal IQ: $F(1, 37) = 0.63$, $p =$

0.67; for the length of staying in the UK: $F(1, 37) = 8.41$, $p = 0.62$). A significant main effect of intervention group on the untrained academic word spelling task was found after controlling for the covariates, $F(2, 37) = 1.52$, $p < 0.01$, partial $\eta^2 = 0.67$. Moreover, the orthographic group ($M = 13.09$) outperformed significantly the phonological group ($M = 11.39$; $p < 0.001$) and the control group ($M = 7.33$; $p < 0.001$), but no significant difference was found between the phonological group and the control group ($p = 0.15$).

Table 3.3. Efficacy of the inteventions.

Test	PA group	Ortho group	Control group	Effect Size
Trained Academic word[a]	6.19***	**23.52*** **	2.14	0.71
Untrained Academic word[a]	3.84**	**4.88*** **	2.55	0.67
Real word Reading[a]	2.87**	**4.07*** **	0.40	0.35
Real word Spelling[a]	1.20**	**3.13*** **	0.20	0.87
Pseudoword Reading[a]	**7.60*** **	1.87***	-0.13	0.68
Pseudoword Spelling[a]	**9.87*** **	5.53***	1.53	0.51
English PA[a]	**10.13*** **	9.93***	-0.13	0.50
Mandarin PA[a]	**6.13** **	2.93	0.60	0.20
Visual Memory	0.60	2.20	0.47	-
English Orthographic Choice[a]	**0.93** **	0.67	0.47	0.62
Mandarin Orthographic Choice	-0.13	0.13	0.20	-

Note. [a]Gains differed significantly between pre- and post-tests.
*p < .05. **p < .01. ***p < .001.

We then conducted paired-samples t-tests to compare the participants' performance on the untrained word spelling in each group to that of their baseline session. The results indicated that, after the implementation of the interventions, the participants in both intervention programmes performed significantly better in untrained word spelling as compared to their pre-test scores ($t(14) = 3.57$, $p < 0.001$, Hedges's $g = 0.45$ for the orthographic group; $t(14) = 4.26$, $p < 0.01$, Hedges's $g = 0.42$). However, for the control group, they made slight improvements, but there was no significant difference between their pre-test score and post-test score ($t(14) = 0.12$, $p = 0.43$).

Summary of ANCOVA analyses on academic word spelling tasks

As shown by the ANCOVA results, after controlling for age, non-verbal IQ, the length of staying in the UK and initial performance on the trained and untrained words, both intervention programmes significantly improved the participants' spelling accuracy in post-intervention time point. As expected, the orthographic intervention was the most effective method for the participants to master the spelling of the target words. Moreover, even the phonological awareness training was not as efficient as the orthographic training, but it still significantly enhanced the participants' performance on the trained words. Similarly, compared to the participants in the orthographic intervention programme, those in the phonological intervention programme have a greater benefit in spelling untrained word skills. All significant gains on these two tasks were found with moderate to large effect sizes (all Hedges's *g*s > 0.42). For the control group, although they attended English taught courses in the university, no significant gain was detected on both tasks.

Word reading and spelling

Four more ANCOVAs were performed on word reading and spelling tasks with intervention group as a between-subject factor and age, length of staying in the UK, non-verbal IQ and pre-test scores as covariates.

Real word reading

The results found that the covariate, pre-test real word reading, was significantly related to the participants' post-test performance on real word reading task, $F(1, 37) = 253.66$, $p < 0.001$, partial $\eta^2 = 0.88$. However, no significant effect was found for other covariates, $F(1, 37) = 1.16$, $p = 0.29$ for non-verbal IQ, $F(1, 37) = 0.75$, $p = 0.39$ for age, and $F(1, 37) = 0.04$, $p = 0.83$ for the length of staying in the UK. After controlling for the effects of covariates, a main effect of the intervention was also found, $F(2, 37) = 9.49$, $p < 0.01$, partial $\eta^2 = 0.35$,

which indicated a significant group difference in the analysis of real word reading task. Post hoc tests established that the participants in the two intervention groups performed significantly better than those in the control group ($p < 0.001$ for the orthographic group and $p < 0.05$ for the phonological group) but there was no significant difference between the two intervention groups ($p = 0.35$). Among the three groups, the orthographic group performed the best (M = 32.48) than the phonological group (*M* = 30.97) and the control group (*M* = 28.58) by comparing the estimated marginal means.

From the result of paired-samples t-test, the participants from both intervention programmes showed significant pre- to post-test effects on real word reading, $t(14) = 5.81$, $p < 0.001$ for the orthographic group, $t(14) = 3.71$, $p < 0.01$ for the phonological group; but not for the control group, $t(14) = 0.75$, $p = 0.47$. Compared to the participants in the phonological group (Hedges's $g = 0.39$), a stronger effect was observed for the orthographic group (Hedges's $g = 0.58$).

Pseudoword reading

In terms of pseudoword reading test, the covariate, pre-test score, was found significantly related to the post-test performance, $F(1, 37) = 496.43$, $p < 0.001$, partial $\eta^2 = 0.93$. There was no significant relationship between age, $F(1, 37) = 2.25$, $p = 0.14$, non-verbal IQ, $F(1, 37) = 0.24$, $p = 0.63$, the length of staying in the UK, $F(1, 37) = 0.47$, $p = 0.50$, and post-test performance. The main effect of intervention methods was also found on pseudoword reading ability after controlling for the covariates, $F(2, 37) = 37.07$ $p < 0.001$, partial $\eta 2 = 0.68$. According to the results of post hoc tests and the estimated marginal means, the phonological group (*M* = 45.28) performed significantly better than the orthographic group (*M* = 40.37) and the control group (*M* = 38.28; all *ps* < 0.001). The participants in the orthographic group also scored significantly higher than the control group ($p < 0.05$).

Paired-samples t-test was conducted to examine the effect of intervention programmes within each group. The results indicated that both intervention programmes significantly increased the pseudoword reading ability in the phonological group ($t(14) = 7.92$, $p < 0.001$), and in the orthographic group ($t(14) = 4.00$, $p < 0.01$); but not in the control group, ($t(14) = -0.34$, $p = 0.74$). Furthermore, the effect of the phonological intervention (Hedges's $g = 1.10$) was stronger than the orthographic intervention (Hedges's $g = 0.26$).

Real word spelling

For the spelling tasks, after controlling for the effects of covariates, the main effect of intervention was found on real word spelling, $F(2, 37) = 7.47$, $p < 0.001$, partial $\eta^2 = 0.30$. However, the covariates were found not significantly related to the participants' real word spelling performance (age: $F(1, 37) = 0.09$, $p = 0.77$; non-verbal IQ: $F(1, 37) = 0.01$, $p = 0.99$; the length of staying in the UK: $F(1, 37) = 0.45$, $p = 0.51$), except for pre-test score, $F(1, 37) = 231.99$, $p < 0.001$, partial $\eta 2 = 0.87$. From the results of Bonferroni adjusted post hoc tests, the orthographic group ($M = 11.94$) significantly outperformed both the phonological group ($M = 10.16$; $p < 0.01$) and the control group ($M = 9.78$; $p < 0.05$) on real word spelling task after the implementation of the intervention programmes, but no significant difference was found between the phonological group and the control group ($p = 0.89$).

After comparing the participants' performance on real word spelling in each group between the pre- and post-intervention time points using the paired-samples t-tests, we found that both intervention groups showed significant improvements on post-intervention performance relative to their pre-intervention performance (the orthographic group: $t(14) = 5.44$, $p < .001$, Hedges's $g = 0.66$, the phonological group: $t(14) = 3.85$, $p < 0.01$, Hedges's $g = 0.28$); however, the post-intervention performance of participants in the control group did not differ from their pre-intervention performance, $t(14) = 0.49$, $p = 0.63$.

Pseudoword spelling

As for the pseudoword spelling task, pre-test score was the only covariate that significantly related to post-test performance, $F(1, 37) = 19.37$, $p < 0.001$, partial $\eta^2 = 0.36$. No significant relationship between other covariates and pseudoword spelling performance (for age: $F(1, 37) = 1.86$, $p = 0.18$; for non-verbal IQ: $F(1, 37) = 5.32$, $p = 0.27$; for the length of staying in the UK: $F(1, 37) = 0.16$, $p = 0.69$). After controlling for the covariates, the main effect of intervention approach was observed on pseudoword spelling performance, $F(2, 37) = 18.22$, $p < 0.001$, partial $\eta^2 = 0.51$. Furthermore, we found that the phonological group ($M = 17.94$) scored significantly higher than the orthographic group ($M = 13.68$; $p < 0.01$) and the control group ($M = 10.22$; $p < 0.001$), and the orthographic group scored significantly higher than the control group ($p < 0.05$) by comparing the estimated marginal means.

Regarding pseudoword spelling skill, all participants participated in both intervention programmes showed significant lower performance on pre-test compared to their post-test score, $t(14) = 6.23$, $p < 0.001$, Hedges's $g = 1.13$ for the orthographic group; $t(14) = 9.43$, $p < 0.001$, Hedges's $g = 2.50$ for the phonological group. In addition, even the control group showed some improvements on pseudoword spelling task, but the effect was not significant, $t(14) = 1.67$, $p = 0.12$.

Summary of ANCOVA analyses on word reading and spelling tasks

In terms of the participants' reading and spelling skills, transfer effects were detected. After controlling for age, non-verbal IQ, length of staying in the UK and pre-test scores, significant improvements were found on all reading and spelling tasks for two intervention groups. Specifically, the participants in the phonological group gained more on pseudoword-related tasks than those in the orthographic group. On the contrary, the

orthographic programme had a stronger effect on real word-related tasks. All significant gains on these two tasks were found with medium to large effect sizes (all Hedges's *g*s > 0.26). As for the control group, they made little improvement on all four tasks and none of the improvements reached significance.

These findings met our expectation. That is, when the participants were taught English phonological structure systematically, which is the fundamental skill of pseudoword reading and spelling, they started to apply what they have learned from the intervention to accomplish the relevant tasks. The results are in agreement with Li & Chen (2016) findings for pseudoword reading, suggesting that phonological awareness training could significantly improve Chinese EFL children's pseudoword reading ability. As for the participants in the orthographic group, they benefited more on real word-related tasks from the orthographic training, which is in line with the previous study carried out with children from alphabetic language backgrounds (e.g., de Jong & Messbauer, 2011; Ise & Schulte-Körne, 2010).

Another point of interest is that even the participants in the orthographic training group have not received specific training on English phonological awareness, they still made significant improvements on pseudoword reading and spelling tasks. This comes in sharp contrast with empirical evidence that training in English orthographic knowledge could only improve alphabetic ELL children's real word reading and spelling skills but not pseudoword decoding skills (Berninger & Abbott, 2013). This difference might be due to the fact that the target words used in the intervention involved a small proportion of consistent words, which could be decoded more effectively by applying grapheme-phoneme skills. When the participants were instructed to read and spell the target words with the assistance of mnemonic pictures, they might develop some phonological awareness.

The participants who received the phonological awareness training also facilitated their real word reading and spelling skills significantly. This would seem to be in line with the fact that after they received systematic training on English phonological structure, they might start to employ phonological skills to decode unfamiliar real words, which corroborates findings from previous studies conducted with ELL children from alphabetic language backgrounds (Quiroga et al., 2002) and ELL children from logographic language background (Sun et al., 2013).

Phonological awareness

Two separate ANCOVAs were conducted to examine the effects of the two intervention programmes on the participants' English and Mandarin phonological awareness with group as the independent variable and the phonological awareness measures in both English and Mandarin employed in this study as dependent variables. Age, non-verbal IQ, the length of staying in the UK and the pre-test scores of the measures were entered as covariates.

For English phonological awareness, three out of four covariates were not significantly related to the post-test score, $F(1, 37) = 0.19$, $p = 0.67$ for age; $F(1, 37) = 0.10$, $p = 0.76$ for non-verbal IQ; $F(1, 37) = 0.02$, $p = 0.89$ for the length of staying in the UK. There was a significant effect of the pre-test score on English phonological awareness, $F(1, 37) = 28.71$, $p < 0.001$, partial $\eta^2 = 0.44$. The results also revealed that, after controlling for the covariates, there was a main effect of intervention methods on English phonological awareness ability, $F(2, 37) = 18.57$, $p < 0.001$, partial $\eta^2 = 0.50$, suggesting that the participants in two intervention groups performed significantly better than those in the control group after receiving the intervention programmes ($M = 30.93$ for the phonological group, $M = 29.95$ for the orthographic group, $M = 21.78$ for the control group, all ps < 0.001); however, there was no significant difference between two intervention groups even the phonological group scored higher than the orthographic group ($p = 0.98$).

The participants' performance on English phonological awareness task at different time points (pre-training and post-training) within each group were then compared using a paired-samples t-test, in which the participants showed significant higher scores on post-test in the phonological group, $t(14) = 6.17$, $p < 0.001$, Hedges's $g = 1.73$, and in the orthographic group, $t(14) = 8.47$, $p < 0.001$, Hedges's $g = 1.48$, but not in the control group, $t(14) = -0.25$, $p = 0.81$.

With respect to the effect of the intervention programmes on Mandarin phonological awareness, no significant effect of age, $F(1, 37) = 0.52$, $p = 0.48$, non-verbal IQ, $F(1, 37) = 7.78$, $p = 0.60$, and the length of staying in the UK, $F(1, 37) = 0.31$, $p = .58$, on Mandarin phonological awareness was found. However, the pre-test score was significantly related to the participants' Mandarin phonological awareness after the implementation of the intervention programmes, $F(1, 37) = 42.74$, $p < 0.001$, partial $\eta^2 = 0.54$. As for the effect of interventions on the participants' Mandarin phonological awareness, the main effect of group, furthermore, was found, $F(2, 37) = 4.55$, $p < 0.05$, partial $\eta 2 = 0.20$. From the results of post hoc comparisons, the significant difference was only found between the control group ($M = 39.54$) and the phonological group ($M = 43.52$, $p < 0.05$), but not between the control group and the orthographic group ($M = 41.18$, $p = 0.63$), and not between the two intervention groups ($p = 0.24$).

The phonological intervention increased participants' performance significantly on Mandarin phonological awareness between two time points (pre-intervention *vs*. post-intervention), $t(14) = 4.17$, $p < 0.01$, Hedges's $g = 1.60$. When we compared Mandarin phonological awareness of the orthographic group and the control group between pre- and post-intervention time points, we found that even these two groups made some improvements between the two-time points, but the effects did not reach statistical

significance ($t(14) = 2.87$, $p = 0.11$ for the orthographic group; $t(14) = 1.46$, $p = 0.17$ for the control group).

Summary of ANCOVA analyses on phonological awareness tasks in English and Mandarin

The results indicated that both intervention methods could help Mandarin-English adult ELLs significantly improve their English phonological awareness, which only partially met our expectation. The findings on the effectiveness of the phonological intervention programme on English phonological awareness are consistent with prior studies conducted with Chinese child ELL learners (Sun et al., 2013). For the orthographic training, even the participants did not receive explicit training on the structure of English phonological awareness, they still improved significantly on English phonological awareness. This unexpected result is in line with prior studies conducted with English-speaking children, which found that orthographic intervention could improve their phonological awareness performance as with English children (Stuart, 1990; Castles et al., 2003). In addition, the control group did not show any improvement, the effect of receiving intensive English-taught courses on mastering English phonological awareness could be ruled out.

The results also indicated that the participants in the phonological group transferred their phonological strategy from L2 back to L1. It is possible that, compared to the phonological structure of Mandarin, English phonological structure is more complicated. Once the participants received the intervention focused on English phonological awareness, they would be able to apply the knowledge they have learned to their L1, which is supported by the theory of backward transfer (Comeau et al., 1999) and the studies conducted with ELL children from alphabetic language background (e.g., Dressler & Kamil, 2006; Goodrich et al., Lonigan & Farver, 2014).

Orthographic knowledge

The ANCOVAs including the pre-test and the post-test were used to examine the effects of differences among three groups on orthographic knowledge in both languages. The post-test scores of these two tasks were entered separately as dependent variables, intervention group was entered as independent variable with age, non-verbal IQ, the length of staying in the UK and pre-test scores as covariates.

For English orthographic knowledge, there was a main effect of intervention approaches on English orthographic knowledge, $F(2, 37) = 4.30$, $p < 0.05$, partial $\eta^2 = 0.19$. Surprisingly, the significant difference on English orthographic knowledge was only found between the control group ($M = 15$) and the phonological group ($M = 15.80$, $p < 0.05$). Even the participants in the orthographic group ($M = 15.33$) performed better than the control group, the difference did not reach statistical significance ($p = 0.67$). In addition, the difference between two intervention groups was not significant neither ($p = 0.26$). As for the four covariates, only pre-test score significantly related to the participants' performance on English orthographic knowledge test, $F(1, 37) = 60.06$, $p < 0.001$, partial $\eta^2 = 0.62$. Other covariates including age, non-verbal IQ and the length of staying in the UK were not significantly associated to English orthographic knowledge ($F(1, 37) = 0.44$, $p = 0.51$ for age; $F(1, 37) = 0.24$, $p = 0.63$ for non-verbal IQ; $F(1, 37) = 2.15$, $p = 0.15$ for the length of staying in the UK).

The paired-samples t-test was conducted then to assess if the participants in each group have made any improvements on English orthographic knowledge. We found that the phonological group was the only group that improved significantly on English orthographic knowledge $t(14) = 3.76$, $p < 0.01$, Hedges's $g = 0.89$. Although the participants' post-intervention English orthographic knowledge in the other two groups showed a trend toward being increased as compared to their pre-intervention performance, the

differences were not significant ($t(14) = 2.87$, $p = 0.12$ for the orthographic group; $t(14) = 1.97$, $p = 0.07$ for the control group).

For Mandarin orthographic knowledge, among all covariates, only pre-test score was significantly related to the post-test score, $F(1, 37) = 142.63$, $p < 0.001$, partial $\eta^2 = 0.98$. No other significant relationship was detected, $F(1, 37) = 0.52$, $p = 0.48$ for age, $F(1, 37) = 0.02$, $p = 0.88$ for non-verbal IQ, $F(1, 37) = 0.16$, $p = 0.70$ for the length of staying in the UK. Nevertheless, no main effect of group on the Mandarin orthographic knowledge measure was found, $F(2, 37) = 1.58$, $p = 0.22$.

With respect to the effect of the intervention on Mandarin orthographic knowledge, we failed to find any significant improvements in all three groups (the phonological group: $t(14) = -1.47$, $p = 0.16$; the orthographic group: $t(14) = 1.47$, $p = 0.17$; the control group: $t(14) = 1.38$, $p = 0.19$).

Summary of ANCOVA analyses on orthographic knowledge tasks in English and Mandarin

Surprisingly, after the implementation of the interventions, only the phonological group made significant improvement on English orthographic knowledge, which was not the focus of the phonological training. For the orthographic group, even they were instructed to use pictures to assist them in mastering orthographic information of the target words, no significant difference was found between pre- and post-tests, which did not meet our expectation.

The results indicated that, unlike phonological awareness, when participants received training focused on English phonological awareness or orthographic knowledge, only the phonological group made significant improvement on English orthographic knowledge task

and the effect of intervention did not transfer to Mandarin orthographic knowledge. In addition, the participants in the other two groups accuracy on this task also remained stable without any significant improvements. One plausible reason could be that the dramatic difference between English and Chinese lead to the difficulty of transferring orthographic knowledge from one language to another. Furthermore, the participants' performance in all three groups on Mandarin orthographic knowledge, achieving over 90% accuracy, reached ceiling. They, hence, have little room for improvement, which might be another reason that the transfer effect has not been detected.

Design memory

The effect of intervention focused on spelling on the design memory ability was also examined by using ANCOVA. The result, $F(2, 37) = 0.77$, $p = 0.47$, partial $\eta^2 = 0.04$, indicated that no main effect was found for intervention group. Visual skill was not the targeted area of the instructional program and therefore the gains on this skill were not expected. As for the covariates, the pre-test score was significantly related to participants' performance on design memory test, $F(1, 37) = 137.39$, $p < 0.001$, partial $\eta^2 = 0.80$. But the significant relationship was not found between other covariates and post-test performance, $F(1, 37) = 0.25$, $p = 0.62$ for ag; $F(1, 37) = 1.59$, $p = 0.22$ for non-verbal IQ; $F(1, 37) = 0.03$, $p = 0.96$ for the length of staying in the UK.

When follow-up paired-samples t-test analyses were conducted by group, there was no significant improvement on this task in each group ($t(14) = 2.26$, $p = 0.42$ for the phonological group; $t(14) = 1.84$, $p = 0.09$ for the orthographic group; $t(14) = 0.82$, $p = 0.43$ for the control group).

Summary of ANCOVA analyses on visual memory

As we expected, the participants in all groups did not make any significant improvements on the design memory task. Because this task was used to measure visual memory ability, which was not the focus of the intervention groups.

3.8 Discussion

In Study 2, we examined the effectiveness of two intervention programmes to enhance academic word spelling through the training of phonological and orthographic skills among Mandarin-English ELL adult learners. The first aim was to investigate whether all three groups made improvements on academic word spelling, general word reading, general word spelling, phonological awareness and orthographic knowledge from pre-test to post-test. The participants were randomly allocated to the phonological training, the orthographic training and the control groups. Overall, we found both intervention programmes positively affected the participants' performance on English reading, spelling, and different cognitive-linguistic skills. Effect sizes for all significant improvements were either medium or large, suggesting that the two intervention programmes that we designed could significantly help Mandarin-English ELL university students with improving their English literacy skills in a small-group size setting with a total of 12-hour intensive intervention. In addition, the effect of phonological intervention also transferred to subjects' phonological awareness in their first language. Furthermore, no intervention effect was detected on visual memory skills, which was expected, as the visual memory was not the target area for our training area. Descriptive statistics indicated that the post-test performance of participants in the control group was slightly better in most cases, compared to their performance on pre-tests. Unfortunately, no significant improvement was observed in the control group on all measures.

In the following sections, the results of the current study will be discussed in relation to empirical evidence in detail, the limitations of the current study will be identified, and the

suggestions for further research that could replication and expand the findings of the current study will be proposed.

Gains on Literacy Skills within Intervention Groups

Empirical evidence has found that children's reading and spelling skills in English could be improved through orthographic training approach and phonological training approach (e.g., for English monolingual children: Cunningham et al., 2002; Bailey et al., 2004; for Spanish ELL children: Cirino et al., 2009; for Chinese ELL children: Yeung et al., 2013; Li & Chen, 2016). The results of the current study indicated that ELL adults who received these two types of interventions increased their reading, spelling (both general word spelling and academic word spelling), and phonological awareness skills. For the phonological intervention group, a significant increase was found in their orthographic knowledge. Based on these results, the current study adds more evidence for the effectiveness of phonological awareness and orthographic skills intervention with adult ELL populations, specifically those who receive higher education in the UK.

The phonological awareness intervention programme

Within the phonological awareness intervention group, the positive training effects were captured by comparing the participants' performance on pre-test with post-test. Specifically, they made gains on all measures, except for the Mandarin orthographic choice task and design memory task. The largest gains were found in English phonological awareness, which met our expectation. The phonological awareness intervention was designed to teach ELL adults the structure of English phonological awareness systematically. In order to encourage the participants to focus on the phonological structure of English words, we minimised the potential influence from long-term knowledge retrieved from lexical and sub-lexical routes by converting target academic words to pseudowords. Munson et al. (2005) pointed out that pseudowords were constructed without any lexical or morpheme clues. In this way, the gains that ELL adults

after the intervention are less likely to be triggered by semantic and lexical knowledge. However, Frisch et al. (2000) mentioned that even pseudowords were generated with a series of low-frequency phonemes, there is still a chance to activate lexical knowledge. Therefore, in the phonological training group, we could not completely rule out the influence of lexical and semantic knowledge.

ELL adults also made significant improvements in English orthographic knowledge, which is out of our expectation. The plausible reason for this unexpecting result is that the word types were used in the current intervention programmes. Even the phonological group received training focused on English phonological structure, the pseudowords still followed English orthographic and phonological structures. When ELL adults were receiving training on phonological awareness, they were also exposed to orthography. Therefore, without the interference from lexical information, the participants would be able to focus on building letter-sound correspondence, which further reinforced adults' orthographic skills. This facilitative effect of explicit training focused on letter-sound correspondences on phonological awareness was supported by empirical evidence conducted with English monolingual children (Castles et al., 2009; Castles et al., 2011). This result indicates the intertwined relationship between phonological awareness and orthographic knowledge that were found English-L1 pre-schoolers could also be generalised to ELL adults, at least to Chinese ELL adults. Further research is also needed to examine if the reciprocal relationship could be replicated with children and/or adults from other language backgrounds.

In terms of word reading and spelling skills, significant gains were found in the phonological training. Furthermore, on both trained and untrained academic words, ELL adults also performed significantly better than their pre-test score. The hypothesis that ELL adults in the phonological awareness training group would only make gains on pseudoword-related tasks, as phonological awareness is the core strategy in decoding pseudowords (Clark et al., 2012). Surprisingly, the phonological group also improved

significantly on real word reading and spelling. However, larger gains were found on pseudoword reading and spelling tests, compared to real word reading and spelling. The results replicated the findings of Li and Chen (2016) that, after receiving English phonological awareness intervention, Mandarin-L1 ELL children from Taiwan had better pseudoword reading performance than real word reading, even gains on both reading tasks reached statistical significance. The positive effects, furthermore, of English phonological awareness found on English word reading were supported by prior studies in English monolingual children (Ludwig et al., 2019) and in ELL children from alphabetic language backgrounds (for Spanish ELL Cirino et al., 2009) and logographic language backgrounds (Sun et al., 2013).

As mentioned in previous section, the ELL adults in the current study acquired Chinese with the assistance of the alphabetic script, Pinyin. Even the structure of Pinyin is phonologically simpler than that of English, Mandarin-L1 individuals were expected to develop some phonological awareness. As an inconsistent language, in order to decode English words proficiently, a higher level of phonemic awareness is required compared to consistent language (e.g., Spanish; Goldenberg et al., 2014). Children from different language backgrounds benefited from English phonological awareness. The intervention effects of phonological intervention were generalised to general word reading and spelling abilities, indicating that despite prior L1 phonological awareness, phonological training is an effective approach to facilitate the acquisition of English. However, very little research has been conducted with ELL adults to investigate the effectiveness of phonological awareness intervention, further research is needed to examine if the facilitative effect can also be found in other adult populations to on English reading and spelling skills.

For visual memory skills, as it was not the focus of the current intervention, no significant improvement was found, which is expected.

Orthographic intervention programme

ELL adults in the current study who were provided with orthographic intervention made significant gains on trained and untrained academic word spelling, real word reading and spelling, pseudoword reading and spelling, English phonological awareness, but not on Mandarin phonological awareness and orthographic skills in both languages.

For the English orthographic skill, the results that ELL adults failed to make significant gains on this task, which was not expected. As the intervention adopted an orthographic processing approach, we were expecting the adults from this group could perform better on the orthographic skill. The plausible explanation of this result is that ELL adults were instructed to create their own pictures to help them memorise the target words. However, the researcher did not restrict the participants from creating orthographic patterns only pictures. As a consequence, even they noticed orthographic information of the target words, their attention might be drifted by other information contained in the words (e.g., meaning, translation). In addition, before each session, a dictation of the words that would be taught in that lesson was conducted with ELL adults. During the lesson, they were encouraged to create the pictures based on the errors from the dictation or based on the way they believed that help with their learning the best. This might mislead the adults to focus more on the semantic information of the words during the training, which is the learning habit that was formed under the traditional learning pattern in English education in China (Fusheng & Rao, 2007). In addition, the researcher did not emphasise letter-sound correspondences explicitly to the participants. They only practised word-specific letter-sound correspondences rather than letter-sound correspondences in general. These settings of the intervention programmes might be the reasons that ELL adults' gains on English orthographic knowledge were not significant.

For phonological awareness, surprisingly, significant gains in English phonological skills were detected with ELL adults who have been exposed to target orthographic

intervention. In the orthographic intervention group, the researcher did not provide explicit phonological awareness instruction. However, previous studies found that vocabulary size is closely related to English phonological awareness (Ehri, 2014). When ELL adults were asked to spell out the target words, spellings were attached to the pronunciations of the words. This process could further clarify the phonemic constituents and enhance the phonological representations in their memory. As a by-product, the meanings of the target words would be bonded better. This process has been supported by Share (2004), in which after one exposure of the word the spelling of the novel words were memorised as long as one month later. In the current orthographic group, before the learners created visual mnemonics, the researcher ensured that they understood the meanings of the target words. Then the recordings of pronunciations of the target words would be played and the learners were encouraged to read out the words while drawing. After they finished drawing, they were asked to spell the words again without visual aids. After completing this process, the learners could build strong connections between the spellings, meanings and pronunciations of the target words. By repeating this process, phonological representations of the words were built in their memory, which further facilitated the development of phonological awareness. This facilitative effect was evident in Share's self-teaching hypothesis (Share, 1995).

In terms of reading and spelling skills, the ELL adults who received orthographic training demonstrated significant improvements on all reading and spelling tasks, especially for the trained words. The results are in line with the study conducted by Ehri et al. (1984). Ehri and colleagues found that children taught with embedded mnemonic learned more grapheme-phoneme associations, which are the key strategy for reading activities, in comparison to the group that received training without pictures. However, they only assessed children's phoneme segmentation skill and letter-sound knowledge. whether the effects of this embedded mnemonic approach could be generalised to other literacy skills is unknown. The results are in contrast to the previous studies that were conducted with children from alphabetic backgrounds, in which the improvements on pseudoword reading and spelling were not found (Berninger et al., 2013). However, this study was conducted

with developmental dyslexia children, the potential impairments in working memory might lead to slower phonological loop function, which could result in phonological deficits. The results of the current study indicated the mnemonic approach could be used to improve ELL adults' English literacy skills, especially for vocabulary learning. Although the orthographic group made dramatic gains on the trained words, without follow-up study, we could not get a firm conclusion that the facilitative effect is long term.

Limitations and further research directions

Despite the findings and implications of the current study, some limitations need to be discussed to provide some potential directions for further research. The first limitation of the current study is the measure we used to assess individuals' phonological awareness. Empirical studies suggested that the development of phonological awareness is from a larger unit to a smaller unit (Ziegler & Goswami, 2005). In addition, the phonological sensitivity to rhyme, syllables and phonemes consists of different abilities (Høien et al., 1995). Although the current study captured improvements made by both intervention groups on English phonological awareness, the phonological awareness mainly measured phoneme deletion ability. The detailed development process of phonological awareness of the participants in the study is not clear. Therefore, further study could assess ELLs' phonological awareness from different levels such as a phoneme, syllable and rime levels. In this way, the development of phonological awareness of adult ELLs could be studied more holistic (Anthony et al., 2002). It might help researchers to design more suitable intervention programmes to support ELLs to further enhance their English literacy skills effectively and efficiently based on their needs.

The second limitation of the current study is that the small group size. Although we were able to detect significant intervention effects in both groups, with a sample size of 15 for each group, we could not perform regression analyses to investigate the pattern of predictive relationships between different cognitive-linguistic factors, reading and spelling

by groups. In addition, without the follow-up test, we could not examine if the intervention effects are only temporary or could be sustained for a longer term.

As suggested by Castles and her colleagues (2009), a six-week training period might not be sufficient enough for the participants in both intervention programmes to apply the skills they learned from the intervention programme to their general reading, spelling and vocabulary learning activities flexibly and proficiently. For further study, a longer intervention duration with a larger sample size should be considered in future research to examine if additional facilitative effects could be found.

Furthermore, a spelling error analysis should also be included. With a qualitative analysis of spelling errors made by the participants, it enables researchers to identify specific weaknesses that could not be captured by linguistic skill measures (Alhaisoni et al., 2015). Once the researcher or educators identify the type of errors made by individuals, better and more suitable support could be provided for further development of students' English literacy skills.

In addition, we named the group as orthographic group and encouraged the learners to practice spelling with mnemonics pictures. However, this training is not purely focused on orthographic knowledge. During the training, semantic, orthographic and phonological information were all included. From this aspect, it is hard to attribute the positive effect to training that focused on orthographic knowledge. Further studies are needed to minimise the potential influence from other cognitive skills and then examine if the effect of orthographic knowledge still exists.

Chapter 4: General Discussion and Conclusion

4.1 Introduction

Previous research evidence has indicated that ELL children from the alphabetic background rely primarily on phonological awareness in their English acquisition process. The similar results have been found with Chinese-L1 ELL children. However, for Chinese-L1 ELL adults, little attention has been paid to their English acquisition process and English litereacy skills. More research is needed to fill this research gap because once their reading and spelling development patterns have been studied and understand, a more holistic picture of the developmemt of English skills could be obtained. By explore the differences between the development of English literacy skills of English monolingual and that of ESL/EFL, it could help researchers to understand more about the stages and characteristics of English acquisition process. In addition, there are more children and adults from non-English language backgrounds immigrate to English-speaking countries, more language minority children and adults will have to learn a language other than their first language. After the difference between the foreign language learners and native speakers has been identified, researchers and practioners would be able to provide sufficient support for language difficulties encountered by individuals.

Little attention has been paid to whether similar results will be observed in reading and spelling abilities of skilled readers. The current study aims to identify differences and similarities in reading and spelling processes in bilingual Mandarin- and English-speaking and monolingual English-speaking participants. The monolingual participants are expected to rely on phonological skills when reading and spelling. The bilingual participants are expected to rely more on whole word recognition skills when reading and spelling in English due to the characteristics of the Chinese writing system. Surprisingly, we found that English phonological awareness and orthographic knowledge contributed to accurate

English reading and spelling. However, for English monolinguals, as they are skilled readers, phonological awareness can only predict their pseudoword-related tasks.

4.1.1 Cognitive linguistic factors that predict English monolinguals and Mandarin-L1 ELL literacy skills

The main research question of Study 1 was to investigate what cognitive-linguistic factors (e.g., phonological awareness, morphological awareness, visual memory and orthographic knowledge) can affect English reading and spelling abilites of English monolingual adults and Mandarin-English bilingual adults. As Chinese is a logographic language, which mainly depends on whole-word recognition and visual memory skill (Holm & Dodd, 1996). However, English is an alphabetic language, even it is highly inconsistent, but phonological awareness is still a core strategy for English literacy skills.

The findings indicated that Mandarin-L1 ELL adults in Study 1 performed significantly poorer than their English monolingual peers on English reading, spelling, reading comprehension, phonological awareness, morphological awareness but outperformed their English monolingual peers on visual memory skills. These results indicated that Mandarin-L1 adults in the current study has a significant poorer English proficiency than their peers.

It is surprising that phonological awareness was a significant predictor of all reading and spelling tasks. Even the phonological awareness of Mandarin-L1 adults was significantly poorer than their English peers, they still employ phonological skills to complete English reading and spelling abilities. The results are consistent with recent studies conducted with Mandarin-English bilingual children that phological awareness is the most important factor that can predic their reading and spelling abilities (Wang et al., 2005; Yeong et al., 2014).

4.1.2 Effectiveness of phonological awareness and orthographic inteventions

The Mandarin-L1 ELLs in the Study 1 performed significantly poorer on English phonological awareness task but it is still the strongest factor that contribute to their English reading and spelling abilities. Therefore, we designed a phonological awareness intervention to examine whether an explicit phonological training could improve Mandarin-L1 ELL's spelling ability.

Previous study also indicated that the Chinese ELLs are prone to use visual strategy to complete English literacy tasks as the visual-analytic skills are more optimal than phonological decoding strategy in their first language. It remains unclear whether two intervention programmes, one with a focus on the phonological structure of English and one with a focus on orthographic knowledge, could facilitate vocabulary acquisition and word spelling ability for Chinese ELLs.

We found both intervention programmes positively affected the participants' performance on English reading, spelling, and different cognitive-linguistic skills even both intervention only lasted for 12 hours, which is relatively a short period time of intervention. Effect sizes for all significant improvements were either medium or large, suggesting that the two intervention programmes that we designed could significantly help Mandarin-English ELL university students with improving their English literacy skills. Morever, phonological awareness intervention helped participants gain more on pseudoword-related tasks and orthographic intervention help them made more gains on the target words learning and real word-related tasks.

4.1.3 Educational implications

The positive effects of both phonological and orthographic intervention on English reading and spelling abilities of Chinese ELL adults were detected, which suggests the need for explicit English instruction may continue through to adulthood even these ELL adults have been learning English since the age of 6. However, English education in China still emphasises the whole word approach and focuses on sentence translation and grammar analyses. Educators in this area might need to consider how to structure English literacy education in a more effective and dynamic way, which could integrate phonological instruction with vocabulary learning to the existing curriculum to support and facilitate the English acquisition process of ELL children and adults. As suggested by Darvin (2006), language learners would be motivated when they could learn the target language in different ways and could use the language in an authentic way. Therefore, it would be meaningful if educators could develop and deliver appropriate supplement instruction based on the learning characteristics of individuals.

The importance of vocabulary knowledge and literacy skills have been identified in the present study. Moreover, both incidental learning and intentional learning are effective approaches that could significantly improve Chinese ELLs' English literacy skills and facilitate vocabulary learning. The current study could also guide educators to incorporate multiple methods based on the designed learning outcomes and objectives to promote learning efficacy. For example, if the lesson is designed to teach target words, educators could encourage students to use the mnemonics technique to acquire new words.

For higher education in the UK, the current study guided designing pre-sessional, 'top-up' English language courses and in-sessional English courses. These courses are developed to help university students' academic English skills (e.g., academic writing skills, note-taking in lectures, presentation skills). However, we might ignore the importance of foundational literacy skills (e.g., reading, spelling and vocabulary knowledge). Therefore, when the educators design these courses, it is important to address the needs and weaknesses of

ELL university students and include instruction focused on basic literacy skills and academic vocabulary learning. Once the students benefit from these basic skills, they could retain and build on what they have learned based on their own needs, potentially improving their academic performance and further increasing student satisfaction with the course and the university.

4.2 Counclusion

The present thesis has extended the current literature by investigating differences in reading and spelling processes in English monolingual adults and Mandarin-L1 ELL adults. As English monolingual adults in Study 1 are skilled readers and spellers, when they are required to read and spell English real words, they could activate the words that are already stored in their long-term memory with little reliance on other cognitive-linguistic skills (phonological and morphological awareness). When encountering the words they have not met before, they would primarily employ phonological awareness to decode and encode the target words. When it turns to Mandarin-L1 adults, phonological awareness is the most potent factor that predicts their English literacy skills. Understanding how Mandarin-L1 adults acquire English literacy has implications for designing English intervention programmes to facilitate their English acquisition process. The current studies also provide guidance to educators and universities in the UK on using phonological awareness and orthographic knowledge instruction to better support the ELL adults, especially Mandarin-L1 ELL adults, who may have difficulties in the English acquisition process and to further improve their academic performance. However, there are some limitations in the current study, which could provide directions for further research. By doing so, we could understand the English acquisition process of English language learners and provide more effective intervention to improve their English proficiency.

List of References

Abbott, R. D., Berninger, V. W., & Fayol, M. (2010). Longitudinal relationships of levels of language in writing and between writing and reading in grades 1 to 7. *Journal of educational psychology*, *102*(2), 281-298.

Adams, M. J., Treiman, R., & Pressley, M. (1998). Reading, Writing, and Literacy. In W. Damon, I. E. Sigel, & K. A. Renninger (Eds.), *Handbook of child psychology: Child psychology in practice* (pp. 275–355). John Wiley & Sons Inc.

Adamson, B. (1995). The 'Four Modernizations' programme in China and English language teacher education: A case study. *Compare*, *25*(3), 197-210.

Adlof, S. M., Perfetti, C. A., & Catts, H. W. (2011). Developmental changes in reading comprehension: Implications for assessment and instruction. *What research has to say about reading instruction* (Vol. 4, pp. 186-214). Newark, DE: International Reading Association.

Ahmad, J. (2012). Intentional vs. incidental vocabulary learning. *ELT Research Journal*, *1*(1), 71-79.

Ahmadi, S. R. M. (2017). The impact of incidental and intentional L2 vocabulary learning on depths and breadth Dimensions of vocabulary knowledge. *The Buckingham Journal of Language and Linguistics*, *10*, 1-17.

Aiken, L. S., West, S. G., & Reno, R. R. (1991). *Multiple regression: Testing and interpreting interactions*. SAGE.

Al-Zuoud, K. M., & Kabilan, M. K. (2013). Investigating Jordanian EFL Students' spelling errors at tertiary level. *International Journal of Linguistics*, *5*(3), 164-176.

Alghamdi, H. H. (2019). Exploring Second Language Vocabulary Learning in ESL Classes. *English Language Teaching*, *12*(1), 78-84.

Alhaisoni, E. M., Al-Zuoud, K. M., & Gaudel, D. R. (2015). Analysis of spelling errors of beginner learners of English in the English foreign language context in Saudi Arabia. *English Language Teaching*, *8*(3), 185-192.

Alhazmi, K., & Milton, J. (2015). Phonological vocabulary size, orthographic vocabulary size, and EFL reading ability among native Arabic speakers. *Journal of Applied Linguistics*, (30), 26-43.

Alloway, T. P., & Gregory, D. (2013). The predictive ability of IQ and working memory scores in literacy in an adult population. *International Journal of Educational Research*, *57*, 51-56.

Altamimi, D., & Rashid, R. A. (2019). Spelling Problems and Causes among Saudi English Language Undergraduates. *Arab World English Journal*, *10*(3), 178-191.

Anjomshoa, L., & Zamanian, M. (2014). The effect of vocabulary knowledge on reading comprehension of Iranian EFL learners in Kerman Azad University. *International Journal on Studies in English Language and Literature (IJSELL)*, *2*(5), 90-95.

Anthony, J. L., Lonigan, C. J., Burgess, S. R., Driscoll, K., Phillips, B. M., & Cantor, B. G. (2002). Structure of preschool phonological sensitivity: Overlapping sensitivity to rhyme, words, syllables, and phonemes. *Journal of experimental child psychology*, *82*(1), 65-92.

Apel, K., Diehm, E., & Apel, L. (2013). Using multiple measures of morphological awareness to assess its relation to reading. *Topics in Language Disorders*, *33*(1), 42-56.

Araújo, S., Reis, A., Petersson, K. M., & Faísca, L. (2015). Rapid automatized naming and reading performance: a meta-analysis. *Journal of Educational Psychology*, *107*(3), 868-883.

Ardasheva, Y., Tretter, T. R., & Kinny, M. (2012). English language learners and academic achievement: Revisiting the threshold hypothesis. *Language Learning*, *62*(3), 769-812.

August, D. E., & Shanahan, T. E. (2006). *Developing literacy in second-language learners: Report of the National Literacy Panel on Language-Minority Children and Youth*. Lawrence Erlbaum Associates Publishers.

August, D., McCardle, P., & Shanahan, T. (2014). Developing literacy in English language learners: Findings from a review of the experimental research. *School Psychology Review*, *43*(4), 490-498.

August, D., Shanahan, T., & Escamilla, K. (2009). English language learners: Developing literacy in second-language learners—Report of the National Literacy Panel on Language-Minority Children and Youth. *Journal of literacy research*, *41*(4), 432-452.

Baddeley, A., Gathercole, S., & Papagno, C. (1998). The phonological loop as a language learning device. *Psychological review*, *105*(1), 158-173.

Badian, N. A. (2001). Phonological and orthographic processing: Their roles in reading prediction. *Annals of Dyslexia*, *51*(1), 177-202.

Bahr, R. H., Silliman, E. R., & Berninger, V. (2009). What spelling errors have to tell about vocabulary learning. In *Contemporary perspectives on reading and spelling* (pp. 121-142). Routledge.

Baik, C., & Greig, J. (2009). Improving the academic outcomes of undergraduate ESL students: the case for discipline-based academic skills programs. *Higher Education Research & Development*, *28*(4), 401-416.

Bailey, C. E., Manis, F. R., Pedersen, W. C., & Seidenberg, M. S. (2004). Variation among developmental dyslexics: Evidence from a printed-word-learning task. *Journal of Experimental Child Psychology*, *87*(2), 125-154.

Baker-Smemoe, W., Dewey, D. P., Bown, J., & Martinsen, R. A. (2014). Variables affecting L2 gains during study abroad. *Foreign Language Annals*, *47*(3), 464-486.

Baldauf, R. B., & Kaplan, R. B. (2005). Language-in-education policy and planning. In *Handbook of research in second language teaching and learning* (pp. 1037-1058). Routledge.

Barcroft, J. (2009). Effects of synonym generation on incidental and intentional L2 vocabulary learning during reading. *TESOL Quarterly*, *43*(1), 79-103.

BBC (2014) *The Sounds of English*. https://www.bbc.co.uk/learningenglish/english/features/pronunciation/introduction

Bear, D. R., Invernizzi, M., Templeton, S., & Johnston, F. (2008). *Words their way: Word study for phonics, vocabulary, and spelling instruction*. Upper Saddle River, NJ: Pearson.

Bear, D. R., Negrete, S., & Cathey, S. (2012). Developmental literacy instruction with struggling readers across three stages. *New England Reading Association Journal*, *48*(1), 1-9.

Bear, D. R., von Gillern, S., & Xu, W. (2018). Learning to Spell in English by Chinese Students: A Cross-Sectional Study. *TESOL International Journal*, *13*(1), 47-66.

Beder, H. (2013). Quality instruction in adult literacy education. *Toward Defining and Improving Quality in Adult Basic Education: Issues and Challenges* (pp. 87-106). Mahwah, NJ: Erlbaum.

Berman, R., & Cheng, L. (2001). English academic language skills: Perceived difficulties by undergraduate and graduate students, and their academic achievement. *Canadian journal of applied linguistics*, *4*(1), 25-40.

Berninger, V. W., & Abbott, R. D. (2013). Differences between children with dyslexia who are and are not gifted in verbal reasoning. *Gifted Child Quarterly*, *57*(4), 223-233.

Berninger, V. W., Lee, Y. L., Abbott, R. D., & Breznitz, Z. (2013). Teaching children with dyslexia to spell in a reading-writers' workshop. *Annals of Dyslexia*, *63*(1), 1-24.

Bertelson, P., Chen, H. C., Tseng, C. H., Ko, H. W., & de Gelder, B. (1999). Phonological awareness and orthographic experience in Chinese readers. *Journal of Chinese Linguistics Monograph Series*, 26-39.

Bi, N. Z. (2019). The Effectiveness of Construct-Relevant and Construct-Irrelevant Strategic Processes on Chinese EFL Learners' Test Performance. In *Chinese-Speaking Learners of English* (pp. 38-51). Routledge.

Bialystok, E., Majumder, S., & Martin, M. M. (2003). Developing phonological awareness: Is there a bilingual advantage?. *Applied Psycholinguistics*, *24*(1), 27-44.

Bifuh-Ambe, E. (2011). Postsecondary learning: Recognizing the needs of English language learners in mainstream university classrooms. *Multicultural Education*, *19*(3), 13-19.

Biname, F., & Poncelet, M. (2016). Order short-term memory capacity predicts nonword reading and spelling in first and second grade. *Reading and Writing*, *29*(1), 1-20.

Birrell, B. (2006). Implications of low English standards among overseas students at Australian universities. *People and place*, *14*(4), 53-64.

Booth, J. R., Perfetti, C. A., & MacWhinney, B. (1999). Quick, automatic, and general activation of orthographic and phonological representations in young readers. *Developmental psychology*, *35*(1), 3-19.

Bowers, P. N., Kirby, J. R., & Deacon, S. H. (2010). The effects of morphological instruction on literacy skills: A systematic review of the literature. *Review of educational research*, *80*(2), 144-179.

Bowey, J. A., & Muller, D. (2005). Phonological recoding and rapid orthographic learning in third-graders' silent reading: A critical test of the self-teaching hypothesis. *Journal of experimental child psychology*, *92*(3), 203-219.

Bowey, J. A., McGuigan, M., & Ruschena, A. (2005). On the association between serial naming speed for letters and digits and word-reading skill: towards a developmental account. *Journal of Research in Reading*, *28*(4), 400-422.

Bretag, T. (2007). The emperor's new clothes: Yes, there is a link between English language competence and academic standards. *People and Place*, *15*(1), 13-21.

Bruton, A. (2009). The vocabulary knowledge scale: A critical analysis. *Language Assessment Quarterly*, *6*(4), 288-297.

Bruton, A., Lopez, M. G., & Mesa, R. E. (2011). Incidental L2 vocabulary learning: An impracticable term?. *TESOL Quarterly*, *45*(4), 759-768.

Bryant, F. B., & Yarnold, P. R. (1995). Principal-components analysis and exploratory and confirmatory factor analysis. In L. G. Grimm & P. R. Yarnold (Eds.), *Reading and understanding multivariate statistics* (pp. 99–136). American Psychological Association.

Burani, C., Marcolini, S., & Stella, G. (2002). How early does morpholexical reading develop in readers of a shallow orthography?. *Brain and language*, *81*(1-3), 568-586.

Bus, A. G., & Van IJzendoorn, M. H. (1999). Phonological awareness and early reading: A meta-analysis of experimental training studies. *Journal of educational psychology*, *91*(3), 403-414.

Butler, Y. G., & Iino, M. (2005). Current Japanese reforms in English language education: The 2003 "action plan". *Language Policy*, *4*(1), 25-45.

Cai, J. (2017). Debates around the orientation of TEFL in Chinese tertiary education. In *Innovation in Language Learning and Teaching* (pp. 115-153). Palgrave Macmillan, London.

Cambridge University Press. (2018). *Cambridge Dictionary.* https://dictionary.cambridge.org

Caravolas, M., Bruck, M., & Genesee, F. (2003). Similarities and differences between English- and French-speaking poor spellers. In N. Goulandris (Ed.), *Dyslexia in different languages: Cross-linguistic comparisons* (pp. 157–180). Whurr Publishers.

Caravolas, M., Hulme, C., & Snowling, M. J. (2001). The foundations of spelling ability: Evidence from a 3-year longitudinal study. *Journal of memory and language*, *45*(4), 751-774.

Caravolas, M., Lervåg, A., Mousikou, P., Efrim, C., Litavský, M., Onochie-Quintanilla, E., Salas, N., Schöffelová, M., Defior, S., Mikulajová, M., Seidlová-Málková, G., and Hulme, C. (2012). Common patterns of prediction of literacy development in different alphabetic orthographies. *Psychological science*, *23*(6), 678-686.

Cardoso-Martins, C., & Pennington, B. F. (2004). The relationship between phoneme awareness and rapid serial naming skills and literacy acquisition: The role of developmental period and reading ability. *Scientific Studies of Reading*, *8*(1), 27-52.

Carless, D. (2012). *From testing to productive student learning: Implementing formative assessment in Confucian-heritage settings*. Routledge.

Carlisle J. (1995) Morphological awareness and early reading achievement. In: Feldman L. B. (eds), *Morphological aspects of language processing* (pp. 189–209). Psychology Press.

Carlisle, J. F. (2003). Morphology matters in learning to read: A commentary. *Reading Psychology*, *24*(3-4), 291-322.

Carlisle, J. F. (2007). Fostering morphological processing, vocabulary development, and reading comprehension. *Vocabulary acquisition: Implications for reading comprehension*, 78-103.

Carlisle, J. F., & Beeman, M. M. (2000). The effects of language of instruction on the reading and writing achievement of first-grade Hispanic children. *Scientific Studies of Reading*, *4*(4), 331-353.

Carlisle, J. F., & Stone, C. A. (2005). Exploring the role of morphemes in word reading. *Reading research quarterly*, *40*(4), 428-449.

Carr, W., & Kemmis, S. (1986). Becoming Critical: Education. *Knowledge and Action Research. London: Falmer*.

Castles, A., Coltheart, M., Larsen, L., Jones, P., Saunders, S., & McArthur, G. (2009). Assessing the basic components of reading: A revision of the Castles and Coltheart test with new norms. *Australian Journal of Learning Difficulties*, *14*(1), 67-88.

Castles, A., Coltheart, M., Wilson, K., Valpied, J., & Wedgwood, J. (2009). The genesis of reading ability: What helps children learn letter–sound correspondences?. *Journal of experimental child psychology*, *104*(1), 68-88.

Castles, A., Holmes, V. M., Neath, J., & Kinoshita, S. (2003). How does orthographic knowledge influence performance on phonological awareness tasks?. *The Quarterly Journal of Experimental Psychology Section A*, *56*(3), 445-467.

Castles, A., Wilson, K., & Coltheart, M. (2011). Early orthographic influences on phonemic awareness tasks: Evidence from a preschool training study. *Journal of Experimental Child Psychology*, *108*(1), 203-210.

Chall, J. S. (1996). *Stages of reading development*. Wadsworth Publishing Company.

Chan, C. K., & Siegel, L. S. (2001). Phonological processing in reading Chinese among normally achieving and poor readers. *Journal of Experimental Child Psychology*, *80*(1), 23-43.

Chang, J. (1987). Chinese speakers. *Learner English*, *2*, 310-324.

Chard, D. J., & Dickson, S. V. (1999). Phonological awareness: Instructional and assessment guidelines. *Intervention in school and clinic*, *34*(5), 261-270.

Chen, I. W. L., & Hsieh, J. J. C. (2011). English language in Taiwan: An examination of its use in society and education in schools. *English language education across Greater China*, 70-94.

Chen, X., Anderson, R. C., Li, W., Hao, M., Wu, X., & Shu, H. (2004). Phonological awareness of bilingual and monolingual Chinese children. *Journal of Educational Psychology*, *96*(1), 142-151.

Chen, X., Hao, M., Geva, E., Zhu, J., & Shu, H. (2009). The role of compound awareness in Chinese children's vocabulary acquisition and character reading. *Reading and Writing*, *22*(5), 615-631.

Chen, X., Xu, F., Nguyen, T. K., Hong, G., & Wang, Y. (2010). Effects of cross-language transfer on first-language phonological awareness and literacy skills in Chinese children receiving English instruction. *Journal of Educational Psychology*, *102*(3), 712-728.

Cheng, A., & Wang, Q. (2012). English language teaching in higher education in China: A historical and social overview. In *Perspectives on teaching and learning English literacy in China* (pp. 19-33). Springer, Dordrecht.

Cheng, L. (2008). The key to success: English language testing in China. *Language Testing*, *25*(1), 15-37.

Cheng, L., & Curtis, A. (2010). *English language assessment and the Chinese learner*. Routledge.

Cheung, A., & Slavin, R. E. (2005). Effective reading programs for English language learners and other language-minority students. *Bilingual Research Journal*, *29*(2), 241-267.

Cheung, H., & Ng, L. K. H. (2003). Pinyin and phonotactics affect the development of phonemic awareness in English-Cantonese bilinguals. *Reading development in Chinese children*, 229-239.

Cheung, H., Chen, H. C., Lai, C. Y., Wong, O. C., & Hills, M. (2001). The development of phonological awareness: Effects of spoken language experience and orthography. *Cognition*, *81*(3), 227-241.

Cheung, H., Chen, H. C., Lai, C. Y., Wong, O. C., & Hills, M. (2001). The development of phonological awareness: Effects of spoken language experience and orthography. *Cognition*, *81*(3), 227-241.

Cheung, H., Chung, K. K. H., Wong, S. W. L., McBride-Chang, C., Penney, T. B., & Ho, C. S. H. (2010). Speech perception, metalinguistic awareness, reading, and vocabulary in Chinese–English bilingual children. *Journal of Educational Psychology*, *102*(2), 367-380.

Chien, C. N., Kao, L. H., & Wei, L. (2008). The role of phonological awareness development in young Chinese EFL learners. *Language Awareness*, *17*(4), 271-288.

China Daily. (2010). *Rush to learn English fuels quality issues.* http://www.chinadaily.com.cn/china/ 2010-08/05/content_11098499.htm

Cho, J. R., & Chiu, M. M. (2015). Rapid naming in relation to reading and writing in Korean (Hangul), Chinese (Hanja) and English among Korean children: A 1-year longitudinal study. *Journal of Research in Reading*, *38*(4), 387-404.

Chow, B. W. Y. (2014). The differential roles of paired associate learning in Chinese and English word reading abilities in bilingual children. *Reading and Writing*, *27*(9), 1657-1672.

Chow, B. W.-Y., McBride-Chang, C., Cheung, H., & Chow, C. S.-L. (2008). Dialogic reading and morphology training in Chinese children: effects on language and literacy. *Developmental Psychology, 44*(1), 233–244.

Chujo, K., & Oghigian, K. (2009). How many words do you need to know to understand TOEIC, TOEFL & EIKEN? An examination of text coverage and high frequency vocabulary. *Journal of Asia TEFL*, *6*(2), 121-148.

Chung, K. K. H., & Ho, C. S. H. (2010) 'Second language learning difficulties in Chinese children with dyslexia: What are the reading-related cognitive skills that contribute to English and Chinese word reading?'. *Journal of Learning Disabilities*, *43*(3), 195-211.

Chung, K. K. H., & Ho, C. S. H. (2010). Second language learning difficulties in Chinese children with dyslexia: What are the reading-related cognitive skills that contribute to English and Chinese word reading?. *Journal of Learning Disabilities*, *43*(3), 195-211.

Cirino, P. T., Vaughn, S., Linan-Thompson, S., Cardenas-Hagan, E., Fletcher, J. M., & Francis, D. J. (2009). One-year follow-up outcomes of Spanish and English interventions for English

language learners at risk for reading problems. *American Educational Research Journal* *46*(3), 744-781.

Clark, N. B., McRoberts, G. W., Van Dyke, J. A., Shankweiler, D. P., & Braze, D. (2012). Immediate memory for pseudowords and phonological awareness are associated in adults and pre-reading children. *Clinical linguistics & phonetics*, *26*(7), 577-596.

Clarke, L. K. (1988). Invented versus traditional spelling in first graders' writings: Effects on learning to spell and read. *Research in the Teaching of English*, 281-309.

Cohen, J. (1988). *Statistical Power Analysis for the Behavioral Sciences (2nd Edition)*. Routledge.

Coltheart, M., Rastle, K., Perry, C., Langdon, R., & Ziegler, J. (2001). DRC: a dual route cascaded model of visual word recognition and reading aloud. *Psychological review*, *108*(1), 204-256.

Comeau, L., Cormier, P., Grandmaison, E., & Lacroix, D. (1999). A longitudinal study of phonological processing skills in children learning to read in a second language. *Journal of Educational Psychology*, *91*(1), 29-43.

Commissaire, E., Duncan, L. G., & Casalis, S. (2011). Cross-language transfer of orthographic processing skills: A study of French children who learn English at school. *Journal of Research in Reading*, *34*(1), 59-76.

Conrad, N. J. (2008). From reading to spelling and spelling to reading: Transfer goes both ways. *Journal of Educational Psychology*, *100*(4), 869-878.

Cortazzi, M., & Jin, L. (1996). English teaching and learning in China. *Language teaching*, *29*(2), 61-80.

Coxhead, A. (2000). A new academic word list. *TESOL quarterly*, *34*(2), 213-238.

Cromley, J. G., & Azevedo, R. (2007). Testing and refining the direct and inferential mediation model of reading comprehension. *Journal of Educational Psychology*, *99*(2), 311-325.

Cummings, A. E., & Barlow, J. A. (2011). A comparison of word lexicality in the treatment of speech sound disorders. *Clinical linguistics & phonetics*, *25*(4), 265-286.

Cummings, D. W. (1988). *American English spelling: An informal description*. JHU Press.

Cummins, J. (1979). Linguistic interdependence and the educational development of bilingual children. *Review of educational research*, *49*(2), 222-251.

Cunningham, A. E., Perry, K. E., & Stanovich, K. E. (2001). Converging evidence for the concept of orthographic processing. *Reading and writing*, *14*(5-6), 549-568.

Cunningham, A. E., Perry, K. E., Stanovich, K. E., & Share, D. L. (2002). Orthographic learning during reading: Examining the role of self-teaching. *Journal of experimental child psychology*, *82*(3), 185-199.

Dai, W., & Hu, W. (2009). *History of the Development of Foreign Language Education in China (1949-2009).* Shanghai Foreign Language Education Press.

Daller, M. H., & Phelan, D. (2013). Predicting international student study success. *Applied Linguistics Review*, *4*(1), 173-193.

Dang, T. N. Y., & Webb, S. (2014). The lexical profile of academic spoken English. *English for Specific Purposes*, *33*, 66-76.

David, M. (2012) *Speech good enough for air traffic control? You are clear to land.* https://www.questia.com/magazine/1P3-2792629271/speech-good-enough-for-air-traffic-control-you-are

Davis, C. J. (2005). N-Watch: A program for deriving neighbourhood size and other psycholinguistic statistics. *Behaviour research methods*, *37*(1), 65-70.

de Jong, P. F., & Messbauer, V. C. (2011). Orthographic context and the acquisition of orthographic knowledge in normal and dyslexic readers. *Dyslexia*, *17*(2), 107-122.

de Jong, P. F., & van der Leij, A. (2002). Effects of phonological abilities and linguistic comprehension on the development of reading. *Scientific studies of Reading*, *6*(1), 51-77.

Deacon, S. H. (2012). Sounds, letters and meanings: The independent influences of phonological, morphological and orthographic skills on early word reading accuracy. *Journal of Research in Reading*, *35*(4), 456-475.

Deacon, S. H., & Bryant, P. (2006). Getting to the root: Young writers' sensitivity to the role of root morphemes in the spelling of inflected and derived words. *Journal of child language*, *33*(2), 401-417.

Deacon, S. H., & Kirby, J. R. (2004). Morphological awareness: Just “more phonological”? The roles of morphological and phonological awareness in reading development. *Applied psycholinguistics*, *25*(2), 223-238.

Deacon, S. H., Kirby, J. R., & Casselman-Bell, M. (2009). How robust is the contribution of morphological awareness to general spelling outcomes?. *Reading Psychology*, *30*(4), 301-318.

Deacon, S. H., Wade-Woolley, L., & Kirby, J. (2007). Crossover: The role of morphological awareness in French immersion children's reading. *Developmental Psychology*, *43*(3), 732-746.

Deacon, S. H., Whalen, R., & Kirby, J. R. (2011). Do children see the danger in dangerous? Grade 4, 6, and 8 children's reading of morphologically complex words. *Applied Psycholinguistics*, *32*(3), 467-481.

Dev, S., & Qiqieh, S. (2016). The Relationship between English Language Proficiency, Academic Achievement and Self-Esteem of Non-Native-English-Speaking Students. *International Education Studies*, *9*(5), 147-155.

Dick, B. (1993). A beginner's guide to action research. *Arcs Newsletter*, *1*(1), 5-9.

Dietrich, J. A., & Brady, S. A. (2001). Phonological representations of adult poor readers: An investigation of specificity and stability. *Applied Psycholinguistics*, *22*(3), 383-418.

Doman, E., & Webb, M. (2017). The flipped experience for Chinese university students studying English as a foreign language. *TESOL Journal*, *8*(1), 102-141.

Dressler, C., & Kamil, M. L. (Collaborator). (2006). First- and Second-Language Literacy. In D. August & T. Shanahan (Eds.), *Developing literacy in second-language learners: Report of the National Literacy Panel on Language-Minority Children and Youth* (pp. 197–238). Lawrence Erlbaum Associates Publishers.

Durgunoğlu, A. Y., Nagy, W. E., & Hancin-Bhatt, B. J. (1993). Cross-language transfer of phonological awareness. *Journal of educational psychology*, *85*(3), 453-465.

Durkin, K., & Main, A. (2002). Discipline-based study skills support for first-year undergraduate students. *Active learning in higher education*, *3*(1), 24-39.

Dussias, P. E., & Sagarra, N. (2007). The effect of exposure on syntactic parsing in Spanish-English bilinguals. *Bilingualism*, *10*(1), 101-116.

Edele, A., & Stanat, P. (2016). The role of first-language listening comprehension in second-language reading comprehension. *Journal of Educational Psychology*, *108*(2), 163-180.

Egan, J., & Tainturier, M. J. (2011). Inflectional spelling deficits in developmental dyslexia. *Cortex*, *47*(10), 1179-1196.

Ehri, L. C. (1986). Sources of difficulty in learning to spell and read. In M. L. Wolraich, & D. Routh (Eds.), *Advancements in developmental and behavioral pediatrics* (pp. 121-195). Greenwich, CT: JAI Press.

Ehri, L. C. (1992). *Reconceptualizing the development of sight word reading and its relationship to recoding.* In P. B. Gough, L. C. Ehri, & R. Treiman (Eds.), *Reading acquisition* (p. 107–143). Lawrence Erlbaum Associates, Inc.

Ehri, L. C. (2000). Learning to read and learning to spell: Two sides of a coin. *Topics in Language Disorders, 20*(3), 19–36.

Ehri, L. C. (2005). Learning to read words: Theory, findings, and issues. *Scientific Studies of reading*, *9*(2), 167-188.

Ehri, L. C. (2014). Orthographic mapping in the acquisition of sight word reading, spelling memory, and vocabulary learning. *Scientific Studies of Reading*, *18*(1), 5-21.

Ehri, L. C., & McCormick, S. (1998). Phases of word learning: Implications for instruction with delayed and disabled readers. *Reading & Writing Quarterly: Overcoming Learning Difficulties*, *14*(2), 135-163.

Ehri, L. C., & Wilce, L. S. (1985). Movement into reading: Is the first stage of printed word learning visual or phonetic?. *Reading Research Quarterly*, 163-179.

Ehri, L. C., Deffner, N. D., & Wilce, L. S. (1984). Pictorial mnemonics for phonics. *Journal of Educational Psychology, 76*(5), 880–893.

Ehri, L. C., Nunes, S. R., Stahl, S. A., & Willows, D. M. (2001). Systematic phonics instruction helps students learn to read: Evidence from the National Reading Panel's meta-analysis. *Review of educational research*, *71*(3), 393-447.

Ehrlich, S., & Avery, P. (2013). *Teaching American English pronunciation-Oxford handbooks for language teachers*. Oxford University Press.

Evans, J. S. B., & Stanovich, K. E. (2013). Dual-process theories of higher cognition: Advancing the debate. *Perspectives on psychological science*, *8*(3), 223-241.

Fastenau, P. S., Denburg, N. L., & Abeles, N. (1996). Age differences in retrieval: Further support for the resource-reduction hypothesis. *Psychology and Aging*, *11*(1), 140-146.

Feng, A. (2012). Spread of English across Greater China. *Journal of Multilingual and Multicultural Development 33*(4), 363–377.

Fidler, F. (2002). The fifth edition of the APA Publication Manual: Why its statistics recommendations are so controversial. *Educational and Psychological Measurement*, *62*(5), 749-770.

Fletcher-Flinn, C. M., Shankweile, D., & Frost, S. J. (2004). Coordination of reading and spelling in early literacy development: An examination of the discrepancy hypothesis. *Reading and Writing*, *17*(6), 617-644.

Foorman, B. R., & Petscher, Y. (2010). Development of spelling and differential relations to text reading in grades 3-12. *Assessment for Effective Intervention*, *36*(1), 7-20.

Forster, K. I., & Forster, J. C. (2003). DMDX: A Windows display program with millisecond accuracy. *Behavior research methods, instruments, & computers*, *35*(1), 116-124.

Fracasso, L. E., Bangs, K., & Binder, K. S. (2016). The contributions of phonological and morphological awareness to literacy skills in the adult basic education population. *Journal of Learning Disabilities*, *49*(2), 140-151.

Frisch, S. A., Large, N. R., & Pisoni, D. B. (2000). Perception of wordlikeness: Effects of segment probability and length on the processing of nonwords. *Journal of memory and language*, *42*(4), 481-496.

Frith, U. (1985). Beneath the surface of developmental dyslexia. *Surface dyslexia*, *32*, 301-330.

Furnes, B., & Samuelsson, S. (2011). Phonological awareness and rapid automatized naming predicting early development in reading and spelling: Results from a cross-linguistic longitudinal study. *Learning and Individual differences*, *21*(1), 85-95.

Fusheng, X., & Rao, Z. (2007). Making native-English-speaking teachers aware of challenges and adapt themselves to EFL teaching in China. *Singapore Tertiary English Teachers Society (STETS) Language and Communication Review*, *6*(1), 29-33.

Gamlam, R. (2016). *How the ESL industry in China is changing.* https://www.gooverseas.com/blog/how-the-esl-industry-in-china-is-changing

Gao, X. (2012). The study of English in China as a patriotic enterprise. *World Englishes*, *31*(3), 351-365.

Gatwiri, G. (2015). The influence of language difficulties on the wellbeing of international students: an interpretive phenomenological analysis. *Inquiries Journal*, *7*(5), 2-21.

Georgiou, G. K., Aro, M., Liao, C. H., & Parrila, R. (2016). Modeling the relationship between rapid automatized naming and literacy skills across languages varying in orthographic consistency. *Journal of Experimental Child Psychology*, *143*, 48-64.

Georgiou, G. K., Papadopoulos, T. C., & Kaizer, E. L. (2014). Different RAN components relate to reading at different points in time. *Reading and Writing*, *27*(8), 1379-1394.

Georgiou, G. K., Parrila, R., & Kirby, J. (2006). Rapid naming speed components and early reading acquisition. *Scientific Studies of Reading*, *10*(2), 199-220.

Georgiou, G. K., Parrila, R., & Liao, C. H. (2008). Rapid naming speed and reading across languages that vary in orthographic consistency. *Reading and writing*, *21*(9), 885-903.

Georgiou, G. K., Wei, W., Inoue, T., & Deng, C. (2020). Are the relations of rapid automatized naming with reading and mathematics accuracy and fluency bidirectional? Evidence from a 5-year longitudinal study with Chinese children. *Journal of Educational Psychology, 112*(8), 1506–1520. https://doi.org/10.1037/edu0000452

Gersten, R., Baker, S. K., Shanahan, T., Linan-Thompson, S., Collins, P., & Scarcella, R. (2007). *Effective Literacy and English Language Instruction for English Learners in the Elementary Grades.* U.S. Department of Education. https://files.eric.ed.gov/fulltext/ED497258.pdf

Geva, E., & Farnia, F. (2012). Developmental changes in the nature of language proficiency and reading fluency paint a more complex view of reading comprehension in ELL and EL1. *Reading and Writing*, *25*(8), 1819-1845.

Geva, E., & Zadeh, Z. (2006). Reading efficiency in native English-speaking and English-as-a-second-language children: The role of oral proficiency and underlying cognitive-linguistic processes. *Scientific Studies of Reading*, *10*(1), 31-57.

Gierut, J. A., Morrisette, M. L., & Ziemer, S. M. (2010). Nonwords and generalization in children with phonological disorders. *American Journal of Speech-Language Pathology*, *19*(2), 167-177.

Glutting, J., Adams, W., & Sheslow, D. (2000) *Wide range intelligence test: WRIT*. Wilmington, DE: Wide Range.

Goldenberg, C., Tolar, T. D., Reese, L., Francis, D. J., Ray Bazán, A., & Mejía-Arauz, R. (2014). How important is teaching phonemic awareness to children learning to read in Spanish?. *American Educational Research Journal*, *51*(3), 604-633.

González-Bueno, M., & Massengill Shaw, D. J. (2011). The Impact of Perception Training on ELL Spelling: Preventing L1 Phonetic Transfer. *Journal of Language Teaching & Research*, *2*(6). 1193-1203.

Goodrich, J. M., Lonigan, C. J., & Farver, J. M. (2014). Children's expressive language skills and their impact on the relation between first-and second-language phonological awareness skills. *Scientific Studies of Reading*, *18*(2), 114-129.

Goodwin, A. P., & Ahn, S. (2013). A meta-analysis of morphological interventions in English: Effects on literacy outcomes for school-age children. *Scientific Studies of Reading*, *17*(4), 257-285.

Goswami, U. (1986). Children's use of analogy in learning to read: A developmental study. *Journal of experimental child psychology*, *42*(1), 73-83.

Goswami, U. & Bryant, P.E. (1990). *Phonological skills and learning to read.* Hove, East Sussex: Psychology Press.

Gottardo, A., Yan, B., Siegel, L. S., & Wade-Woolley, L. (2001). Factors related to English reading performance in children with Chinese as a first language: More evidence of cross-language transfer of phonological processing. *Journal of educational psychology*, *93*(3), 530-542.

Gough, P. B., & Hillinger, M. L. (1980). Learning to read: An unnatural act. *Annals of Dyslexia*, *30*(1), 179-196.

Goulandris, N. K., & Snowling, M. (1991). Visual memory deficits: A plausible cause of developmental dyslexia? Evidence from a single case study. *Cognitive Neuropsychology*, *8*(2), 127-154.

GOV.UK (2019) *International Education Strategy: global potential, global growth.* https://www.gov.uk/government/publications/international-education-strategy-global-potential-global-growth/international-education-strategy-global-potential-global-growth#global-reach

Graham, S. (2000). Should the natural learning approach replace spelling instruction?. *Journal of educational psychology*, *92*(2), 235-247.

Graham, S. (2006). Listening comprehension: The learners' perspective. *System*, *34*(2), 165-182.

Graham, S., & Santangelo, T. (2014). Does spelling instruction make students better spellers, readers, and writers? A meta-analytic review. *Reading and Writing*, *27*(9), 1703-1743.

Greenberg, D., Ehri, L. C., & Perin, D. (2002). Do adult literacy students make the same word-reading and spelling errors as children matched for word-reading age?. *Scientific Studies of Reading*, *6*(3), 221-243.

Greene, J. P. (1997). A meta-analysis of the Rossell and Baker review of bilingual education research. *Bilingual Research Journal*, *21*(2-3), 103-122.

Greenleaf, C. L., Litman, C., Hanson, T. L., Rosen, R., Boscardin, C. K., Herman, J., & Jones, B. (2011). Integrating literacy and science in biology: Teaching and learning impacts of reading apprenticeship professional development. *American Educational Research Journal*, *48*(3), 647-717.

Gu, Y., & Johnson, R. K. (1996). Vocabulary learning strategies and language learning outcomes. *Language learning*, *46*(4), 643-679.

Hagiliassis, N., Pratt, C., & Johnston, M. (2006). Orthographic and phonological processes in reading. *Reading and Writing*, *19*(3), 235-263.

Hakuta, K., Butler, Y.G., & Witt, D. (2000). *How long does it take English learners to attain proficiency?* Santa Barbara, CA: University of California Linguistic Minority Research Institute.

Hamilton, E. E. (2007). *The Importance of Phonological Processing in English-and Mandarin-speaking Emergent and Fluent Readers* [Doctoral dissertation, University of Michigan]. https://deepblue.lib.umich.edu/bitstream/handle/2027.42/57695/eehamilt_1.pdf?sequence=2

Han, J., & Yin, H. (2016). College English curriculum reform in Mainland China: Contexts, contents and changes. *Asian Education Studies*, *1*(1), 1-10.

Hansen, J. G. (2000). Interactional conflicts among audience, purpose, and content knowledge in the acquisition of academic literacy in an EAP course. *Written communication*, *17*(1), 27-52.

Harrington, M., & Carey, M. (2009). The on-line Yes/No test as a placement tool. *System*, *37*(4), 614-626.

Hatcher, P. J., Duff, F. J., & Hulme, C. (2014). *Sound linkage: An integrated programme for overcoming reading difficulties*. John Wiley & Sons.

Heikkilä, R., Närhi, V., Aro, M., & Ahonen, T. (2009). Rapid automatized naming and learning disabilities: Does RAN have a specific connection to reading or not?. *Child Neuropsychology*, *15*(4), 343-358.

Helman, L. A. (2004). Building on the sound system of Spanish: Insights from the alphabetic spellings of English-language learners. *The Reading Teacher*, *57*(5), 452-460.

Helman, L., Delbridge, A., Parker, D., Arnal, M., & Jara Mödinger, L. (2016). Measuring Spanish orthographic development in private, public and subsidised schools in Chile. *Assessment in Education: Principles, Policy & Practice*, *23*(3), 327–352.

Henbest, V. S., Fitton, L., Werfel, K. L., & Apel, K. (2020). The Relation Between Linguistic Awareness Skills and Spelling in Adults: A Comparison Among Scoring Procedures. *Journal of Speech, Language, and Hearing Research*, *63*(4), 1240-1253.

Henderson, E. H. (1981). *Learning to read and spell: The child's knowledge of words*. Northern Illinois University Press.

HESA. (2018). *Higher Education Student Statistics: UK, 2017/18.* https://www.hesa.ac.uk/news/17-01-2019/sb252-higher-education-student-statistics

HESA. (2022). *Higher Education Student Statistics: UK, 2020/21 - Where students come from and go to study.* https://www.hesa.ac.uk/news/25-01-2022/sb262-higher-education-student-statistics/location

Hess, F. M., Rotherham, A. J., & Walsh, K. (2005). Finding the Teachers We Need. Policy Perspectives. *WestEd*.

Ho, C. S-H., Yau, P. W-Y., & Au, A. (2003). Development of orthographic knowledge and its relationship with reading and spelling among Chinese kindergarten and primary school children. In C. McBride-Chang & H.-C. Chen (Eds.), *Reading development in Chinese children* (pp. 51– 71). Westport, CT: Praeger Press.

Ho, C. S. H., & Bryant, P. (1999). Different visual skills are important in learning to read English and Chinese. *Educational and Child Psychology, 16*(4), 4-14.

Ho, C. S. H., & Fong, K. M. (2005). Do Chinese dyslexic children have difficulties learning English as a second language?. *Journal of psycholinguistic research*, *34*(6), 603-618.

Ho, C. S. H., Law, T. P. S., & Ng, P. M. (2000). The phonological deficit hypothesis in Chinese developmental dyslexia. *Reading and Writing*, *13*(1), 57-79.

Høien, T., Lundberg, I., Stanovich, K. E., & Bjaalid, I. K. (1995). Components of phonological awareness. *Reading and writing*, *7*(2), 171-188.

Holm, A., & Dodd, B. (1996). The effect of first written language on the acquisition of English literacy. *Cognition*, *59*(2), 119-147.

Holmes, V. M. (2012). Adult word recognition and visual sequential memory. *Reading and Writing*, *25*(1), 23-44.

Hong, X. (2010). Review of Effects of Glosses on Incidental Vocabulary Learning and Reading Comprehension. *Chinese Journal of Applied Linguistics (Foreign Language Teaching & Research Press)*, *33*(1), 56-73.

Hoosain, R. (1991). Cerebral lateralization of bilingual functions after handedness switch in childhood. *The Journal of genetic psychology*, *152*(2), 263-268.

Hoosain, R. (2013). *Psycholinguistic implications for linguistic relativity: A case study of Chinese*. Psychology Press.

Hornung, C., Martin, R., & Fayol, M. (2017). General and specific contributions of RAN to reading and arithmetic fluency in first graders: a longitudinal latent variable approach. *Frontiers in psychology*, *8*, 1-13.

Hsu, L. S. J., Ip, K. I., Arredondo, M. M., Tardif, T., & Kovelman, I. (2019). Simultaneous acquisition of English and Chinese impacts children's reliance on vocabulary, morphological and phonological awareness for reading in English. *International journal of bilingual education and bilingualism*, *22*(2), 207-223.

Hsueh-Chao, MH., & Nation, P. (2000). Unknown vocabulary density and reading comprehension. *Reading in a Foreign Language*, *13*, 403–430.

Hu, G. (2003). English language teaching in China: Regional differences and contributing factors. *Journal of multilingual and multicultural development*, *24*(4), 290-318.

Hu, G., & McKay, S. L. (2012). English language education in East Asia: Some recent developments. *Journal of Multilingual and Multicultural Development*, *33*(4), 345-362.

Huang, H. S., and Hanley, J. R. (1995) Phonological awareness and visual skills in learning to read Chinese and English. *Cognition*, *54*(1), 73-98.

Huang, J. T., & Liu, I. M. (1978). Paired-associate learning proficiency as a function of frequency count, meaningfulness, and imagery value in Chinese 2-character ideograms. *Acta Psychologica Taiwanica*, *20*(1), 5-17.

Huckin, T., & Coady, J. (1999). Incidental vocabulary acquisition in a second language: A review. *Studies in second language acquisition*, 181-193.

Hulme, C., Bowyer-Crane, C., Carroll, J. M., Duff, F. J., & Snowling, M. J. (2012). The causal role of phoneme awareness and letter-sound knowledge in learning to read: Combining intervention studies with mediation analyses. *Psychological science*, *23*(6), 572-577.

Hung, D. L., & Tzeng, O. J. (1981). Orthographic variations and visual information processing. *Psychological bulletin*, *90*(3), 377-414.

Hung, D. L., Tzeng, O. J., & Tzeng, A. K. (1992). Automatic activation of linguistic information in Chinese character recognition. In *Advances in psychology* (Vol. 94, pp. 119-130). North-Holland.

Hyatt, D. (2013). Stakeholders' perceptions of IELTS as an entry requirement for higher education in the UK. *Journal of Further and Higher Education*, *37*(6), 844-863.

Hyatt, D., & Brooks, G. (2009). Investigating stakeholders' perceptions of IELTS as an entry requirement for higher education in the UK. *IELTS research reports*, *10*, 17-68.

Ise, E., & Schulte-Körne, G. (2010). Spelling deficits in dyslexia: Evaluation of an orthographic spelling training. *Annals of Dyslexia*, *60*(1), 18-39.

Jackson, N. E., Lu, W. H., & Ju, D. (1994). Reading Chinese and reading English: Similarities, differences, and second-language reading. In *The varieties of orthographic knowledge* (pp. 73-109). Springer, Dordrecht.

Jaeggi, S. M., Buschkuehl, M., Jonides, J., & Perrig, W. J. (2008). Improving fluid intelligence with training on working memory. *Proceedings of the National Academy of Sciences*, *105*(19), 6829-6833.

Jarvis, H. L., & Gathercole, S. E. (2003). Verbal and non-verbal working memory and achievements on national curriculum tests at 11 and 14 years of age. *Educational and Child Psychology*, *20*(3), 123-140.

Jenkins, L., Myerson, J., Joerding, J. A., & Hale, S. (2000). Converging evidence that visuospatial cognition is more age-sensitive than verbal cognition. *Psychology and aging*, *15*(1), 157-175.

Jiang, Z. (2008). Developing CALL to Meet the Needs of Language Teaching and Learning. *English Language Teaching*, *1*(2), 108-113.

Jin, Y., de Bot, K., & Keijzer, M. (2017). Affective and situational correlates of foreign language proficiency: A study of Chinese university learners of English and Japanese. *Studies in Second Language Learning and Teaching*, *7*(1), 105-125.

Jolly Learning (2018) *English Alphabetic Code.* https://www.jollylearning.co.uk/resource-bank/english-alphabetic-code/

Jongejan, W., Verhoeven, L., & Siegel, L. S. (2007). Predictors of reading and spelling abilities in first-and second-language learners. *Journal of educational psychology*, *99*(4), 835-851.

Juel, C. (1983). The development and use of mediated word identification. *Reading Research Quarterly*, *18*(3), 306-327.

Juel, C., & Minden-Cupp, C. (2000). Learning to read words: Linguistic units and instructional strategies. *Reading research quarterly*, *35*(4), 458-492.

Kang, J. Y. (2012). Do bilingual children possess better phonological awareness? Investigation of Korean monolingual and Korean-English bilingual children. *Reading and Writing*, *25*(2), 411-431.

Katz, L., & Frost, R. (1992). The reading process is different for different orthographies: The orthographic depth hypothesis. In *Advances in psychology* (Vol. 94, pp. 67-84). North-Holland.

Kemmis, S., & Grundy, S. (1997). Educational action research in Australia: Organizations and practice. *International action research: A casebook for educational reform*, 40-48.

Keuleers, E., & Brysbaert, M. (2010). Wuggy: A multilingual pseudoword generator. *Behavior research methods*, *42*(3), 627-633.

Keung, Y. C., & Ho, C. S. H. (2009). Transfer of reading-related cognitive skills in learning to read Chinese (L1) and English (L2) among Chinese elementary school children. *Contemporary Educational Psychology*, *34*(2), 103-112.

Kieffer, M. J., Petscher, Y., Proctor, C. P., & Silverman, R. D. (2016). Is the whole greater than the sum of its parts? Modeling the contributions of language comprehension skills to reading comprehension in the upper elementary grades. *Scientific Studies of Reading*, *20*(6), 436-454.

Kiernan, D., & R. Bear, D. (2018). What spelling tells us about the orthographic development and word study instruction with emergent bilingual secondary students. *Reading Psychology*, *39*(3), 227-252.

Kilpatrick, D. A. (2015). *Essentials of assessing, preventing, and overcoming reading difficulties*. John Wiley & Sons.

Kim, H. Y. (2013). Statistical notes for clinical researchers: assessing normal distribution (2) using skewness and kurtosis. *Restorative dentistry & endodontics*, *38*(1), 52-54.

Kirby, J. R., Georgiou, G., Martinussen, R., & Parrila, R. (2010). Naming speed and reading: From prediction to instruction. *Reading Research Quarterly, 45*, 341-362.

Kirby, J. R., Parrila, R. K., & Pfeiffer, S. L. (2003). Naming speed and phonological awareness as predictors of reading development. *Journal of Educational Psychology*, *95*(3), 453-464.

Kirkgoz, Y. (2005). English language teaching in Turkey: Challenges for the 21st century. *Teaching English to the world: History, curriculum, and practice*, 159-175.

Koda, K., Lü, C., & Zhang, D. (2014). L1-induced facilitation in biliteracy development in Chinese and English. In *Reading development and difficulties in monolingual and bilingual Chinese children* (pp. 141-169). Springer, Dordrecht.

Kohnen, S., Nickels, L., & Coltheart, M. (2010). Skill generalisation in teaching spelling to children with learning difficulties. *Australian Journal of Learning Difficulties*, *15*(2), 115-129.

Kohnen, S., Nickels, L., Brunsdon, R., & Coltheart, M. (2008). Patterns of generalisation after treating sub-lexical spelling deficits in a child with mixed dysgraphia. *Journal of Research in Reading*, *31*(1), 157-177.

Kondal, B. (2015). The Significance of Motivation in the ESL Classroom. *Language in India*, *15*(12), 70-77.

Krashen, S. (2002). Theory versus practice in language training. In *Enriching ESOL pedagogy* (pp. 235-252). Routledge.

Kremin, L. V., Arredondo, M. M., Hsu, L. S. J., Satterfield, T., & Kovelman, I. (2019). The effects of Spanish heritage language literacy on English reading for Spanish–English bilingual children in the US. *International journal of bilingual education and bilingualism*, *22*(2), 192-206.

Kroll, J. F., Dussias, P. E., Bice, K., & Perrotti, L. (2015). Bilingualism, mind, and brain. *Annu. Rev. Linguist.*, *1*(1), 377-394.

Kruidenier, J. (2002). *based principles for adult basic education reading instruction*. DIANE Publishing.

Kuhn, M. R., & Stahl, S. A. (2003). Fluency: A review of developmental and remedial practices. *Journal of educational psychology*, *95*(1), 3-21.

Kuncel, N. R., Hezlett, S. A., & Ones, D. S. (2004). Academic performance, career potential, creativity, and job performance: Can one construct predict them all?. *Journal of personality and social psychology*, *86*(1), 148-161.

Kuo, L. J., Li, Y., Sadoski, M., & Kim, T. J. (2014). Acquisition of Chinese characters: the effects of character properties and individual differences among learners. *Contemporary educational psychology*, *39*(4), 287-300.

Lafrance, A., & Gottardo, A. (2005). A longitudinal study of phonological processing skills and reading in bilingual children. *Applied Psycholinguistics*, *26*(4), 559-578.

Lakens, D. (2013). Calculating and reporting effect sizes to facilitate cumulative science: a practical primer for t-tests and ANOVAs. *Frontiers in psychology*, *4*, 863-875.

Lam, A. S. (2005). *Language education in China: Policy and experience from 1949: Policy and experience from 1949*. Hong Kong University Press.

Lam, S. S. Y., & McBride-Chang, C. (2013). Parent-child joint writing in Chinese kindergartners: explicit instruction in radical knowledge and stroke writing skills. *Writing Systems Research, 5*, 88–109.

Landerl, K., Freudenthaler, H. H., Heene, M., De Jong, P. F., Desrochers, A., Manolitsis, G., Parrila, R., & Georgiou, G. K. (2019). Phonological awareness and rapid automatized naming as longitudinal predictors of reading in five alphabetic orthographies with varying degrees of consistency. *Scientific Studies of Reading*, *23*(3), 220-234.

Language and Teaching Institute of Beijing Linguistic College. (1986). *Xiandai Hanyu Pinlu Cidian* [*Modern Chinese frequency dictionary*]. Beijing, China: Beijing Language Institute Press.

Laufer, B., & Hulstijn, J. (2001). Incidental vocabulary acquisition in a second language: The construct of task-induced involvement. *Applied linguistics*, *22*(1), 1-26.

Leck, K. J., Weekes, B. S., and Chen, M. J. (1995) Visual and phonological pathways to the lexicon: Evidence from Chinese readers. *Memory and Cognition*, *23*(4), 468-476.

Lee, C. Y. (2007). Does horse activate mother? Processing lexical tone in form priming. *Language and Speech*, *50*(1), 101-123.

Lei, L., Pan, J., Liu, H., McBride-Chang, C., Li, H., Zhang, Y., ..., Shu, H. (2011). Developmental trajectories of reading development and impairment from ages 3 to 8 years in Chinese children. *Journal of Child Psychology and Psychiatry, 52*(2), 212–220.

Lei, S.A., Bartlett, K.A., Gorney, S.E., & Herschbach, T.R. (2010). Resistance to reading compliance among college students: Instructors' perspectives. *College Student Journal*, *44*(2), 219-229.

Leong, C. K., Cheng, P. W., & Tan, L. H. (2005). The role of sensitivity to rhymes, phonemes and tones in reading English and Chinese pseudowords. *Reading and Writing*, *18*(1), 1-26.

Leong, C. K., Loh, K. Y., Ki, W. W., & Tse, S. K. (2011). Enhancing orthographic knowledge helps spelling production in eight-year-old Chinese children at risk for dyslexia. *Annals of Dyslexia, 61*(1), 136–160.

Leong, C. K., Tan, L. H., Cheng, P. W., & Hau, K. T. (2005). Learning to read and spell English words by Chinese students. *Scientific Studies of Reading*, *9*(1), 63-84.

Lerkkanen, M. K., Rasku-puttonen, H., Aunola, K., & Nurmi, J. E. (2004). Predicting reading performance during the first and the second year of primary school. *British Educational Research Journal*, *30*(1), 67-92.

Lervåg, A., & Hulme, C. (2009). Rapid automatized naming (RAN) taps a mechanism that places constraints on the development of early reading fluency. *Psychological Science*, *20*(8), 1040-1048.

Lesaux, N. K., & Siegel, L. S. (2003). The development of reading in children who speak English as a second language. *Developmental psychology*, *39*(6), 1005-1019.

Lesaux, N. K., Kieffer, M. J., Kelley, J. G., & Harris, J. R. (2014). Effects of academic vocabulary instruction for linguistically diverse adolescents: Evidence from a randomized field trial. *American Educational Research Journal*, *51*(6), 1159-1194.

Li, B., & Hudson, P. (2011). Understanding Chinese TEFL academics' capacity for research. *Journal of Further and Higher Education, 35*(3), 391-407.

Li, C. N., & Thompson, S. A. (1989). *Mandarin Chinese: A functional reference grammar.* University of California Press.

Li, D. (1993). *A study of Chinese characters.* Beijing: Peking University Press

Li, G., Chen, W., & Duanmu, J. L. (2010). Determinants of international students' academic performance: A comparison between Chinese and other international students. *Journal of Studies in International Education*, *14*(4), 389-405.

Li, M. (2018). The effectiveness of a bilingual education program at a Chinese university: a case study of social science majors. *International Journal of Bilingual Education and Bilingualism*, *21*(8), 897-912.

Li, S., Tao, S., Joshi, R. M., & Xu, Q. (2018). Second-Language Reading Difficulties Among Native Chinese-Speaking Students Learning to Read English: The Roles of Native-and Second-Language Skills. *Reading Research Quarterly*, *53*(4), 423-441.

Li, Y. S., & Chen, S. H. (2016). Relative effectiveness of phonological and morphological awareness training on L2 word reading in EFL children. *System*, *60*, 93-104.

Liao, C. H., Georgiou, G. K., & Parrila, R. (2008). Rapid naming speed and Chinese character recognition. *Reading and Writing*, *21*(3), 231-253.

Lin, D., Sun, H., & Zhang, X. (2016). Bidirectional relationship between visual spatial skill and Chinese character reading in Chinese kindergartners: A cross-lagged analysis. *Contemporary Educational Psychology*, *46*, 94-100.

Lin, P. M. (2014). Investigating the validity of internet television as a resource for acquiring L2 formulaic sequences. *System*, *42*, 164-176.

Liow, S. J. R., & Lau, L. H.-S. (2006). The development of bilingual children's early spelling in English. *Journal of Educational Psychology, 98*(4), 868–878. https://doi.org/10.1037/0022-0663.98.4.868

Liow, S. J. R., & Poon, K. K. (1998). Phonological awareness in multilingual Chinese children. *Applied Psycholinguistics*, *19*(3), 339-362.

Lonigan, C. J., Burgess, S. R., & Anthony, J. L. (2000). Development of emergent literacy and early reading skills in preschool children: evidence from a latent-variable longitudinal study. *Developmental psychology*, *36*(5), 596-613.

Ludwig, C., Guo, K., & Georgiou, G. K. (2019). Are Reading Interventions for English Language Learners Effective? A Meta-Analysis. *Journal of learning disabilities*, *52*(3), 220-231.

Magpuri-Lavell, T., Paige, D., Williams, R., Akins, K., & Cameron, M. (2014). The effects of a summer reading program using simultaneous multisensory instruction of language arts on reading proficiency. *Reading Improvement*, *51*(4), 361-372.

Majerus, S., Poncelet, M., Van der Linden, M., Albouy, G., Salmon, E., Sterpenich, V., Vandewalle, G., Collette, F., & Maquet, P. (2006). The left intraparietal sulcus and verbal short-term memory: Focus of attention or serial order?. *Neuroimage*, *32*(2), 880-891.

Manis, F. R., Seidenberg, M. S., & Doi, L. M. (1999). See Dick RAN: Rapid naming and the longitudinal prediction of reading subskills in first and second graders. *Scientific Studies of reading*, *3*(2), 129-157.

Mann, V. A. (1985). A cross-linguistic perspective on the relation between temporary memory skills and early reading ability. *Remedial and Special Education*, *6*(6), 37-42.

Manolitsis, G., Georgiou, G. K., & Parrila, R. (2011). Revisiting the home literacy model of reading development in an orthographically consistent language. *Learning and Instruction*, *21*(4), 496-505.

Marian, V., Blumenfeld, H. K., & Kaushanskaya, M. (2007). The Language Experience and Proficiency Questionnaire (LEAP-Q): Assessing language profiles in bilinguals and multilinguals. *Journal of Speech, Language, and Hearing Research, 50*(4), 940-967.

Marton, F., Tse, S. K., & Cheung, W. M. (2010). *On the learning of Chinese*. BRILL.

Mason, J. M. (1980). When do children begin to read: An exploration of four year old children's letter and word reading competencies. *Reading Research Quarterly*, 203-227.

Masrai, A., & Milton, J. (2017). Recognition Vocabulary Knowledge and Intelligence as Predictors of Academic Achievement in EFL Context. *TESOL International Journal*, *12*(1), 128-142.

Masrai, A., & Milton, J. (2018). Measuring the contribution of academic and general vocabulary knowledge to learners' academic achievement. *Journal of English for Academic Purposes*, *31*, 44-57.

Masterson, J., Colombo, L., Spencer, K., Ftika, K., & Syntili, A. (2008). Factors affecting spelling of English-and Greek-speaking Grade 1 and 2 children. In *London: Presented at the 1st Writing Systems Conference, Institute of Education*.

Mayer, R. E., & Massa, L. J. (2003). Three facets of visual and verbal learners: Cognitive ability, cognitive style, and learning preference. *Journal of educational psychology*, *95*(4), 833-856.

McBride-Chang, C., & Chen, H. C. (2003). *Reading development in Chinese children*. ABC-CLIO.

McBride-Chang, C., & Ho, C. S. H. (2000). Developmental issues in Chinese children's character acquisition. *Journal of Educational Psychology*, *92*(1), 50-55.

McBride-Chang, C., & Treiman, R. (2003). Hong Kong Chinese kindergartners learn to read English analytically. *Psychological Science*, *14*(2), 138-143.

McBride-Chang, C., Bialystok, E., Chong, K. K., & Li, Y. (2004). Levels of phonological awareness in three cultures. *Journal of experimental child psychology*, *89*(2), 93-111.

McBride-Chang, C., Cheung, H., Chow, B. Y., Chow, C. L., & Choi, L. (2006). Metalinguistic skills and vocabulary knowledge in Chinese (L1) and English (L2). *Reading and Writing*, *19*(7), 695-716.

McBride-Chang, C., Cho, J. R., Liu, H., Wagner, R. K., Shu, H., Zhou, A., Cheuk, C., & Muse, A. (2005). Changing models across cultures: Associations of phonological awareness and morphological structure awareness with vocabulary and word recognition in second graders from Beijing, Hong Kong, Korea, and the United States. *Journal of experimental child psychology*, *92*(2), 140-160.

McBride-Chang, C., Lam, F., Lam, C., Chan, B., Fong, C. Y.-C., Wong, T. T.-Y., & Wong, S. W.-L. (2011b). Early predictors of dyslexia in Chinese children: familial history of dyslexia, language delay, and cognitive profiles. *Journal of Child Psychology and Psychiatry, 52*(2), 204–211

McBride-Chang, C., Liu, P. D., Wong, T., Wong, A., & Shu, H. (2012). Specific reading difficulties in Chinese, English, or both: Longitudinal markers of phonological awareness, morphological awareness, and RAN in Hong Kong Chinese children. *Journal of learning disabilities*, *45*(6), 503-514.

McBride-Chang, C., Shu, H., Zhou, A., Wat, C. P., & Wagner, R. K. (2003). Morphological awareness uniquely predicts young children's Chinese character recognition. *Journal of educational psychology*, *95*(4), 743-751.

McBride-Chang, C., Tong, X., Shu, H., Wong, A. M. Y., Leung, K. W., & Tardif, T. (2008). Syllable, phoneme, and tone: Psycholinguistic units in early Chinese and English word recognition. *Scientific Studies of Reading*, *12*(2), 171-194.

McBride–Chang, C., & Kail, R. V. (2002). Cross–cultural similarities in the predictors of reading acquisition. *Child development*, *73*(5), 1392-1407.

McBride, C. (2015). *Children's literacy development: A cross-cultural perspective on learning to read and write*. Routledge.

McCutcheon, G., & Jung, B. (1990). Alternative perspectives on action research. *Theory into practice*, *29*(3), 144-151.

McIntyre, N. S. (2015). *Social, language, and executive cognition factors in reading development in school-aged children with high-functioning autism* [Doctoral dissertation, University of California]. ProQuest Dissertation. https://www.proquest.com/openview/936ab7b3d8c60e50c0f5db57d7ba9c04/1?pq-origsite=gscholar&cbl=18750

McKague, M., Pratt, C., & Johnston, M. B. (2001). The effect of oral vocabulary on reading visually novel words: A comparison of the dual-route-cascaded and triangle frameworks. *Cognition*, *80*(3), 231-262.

McKenna, M. C., & Stahl, K. A. (2009). *Assessment for reading instruction* (2nd ed.). New York, NY: Guilford.

Meeks, L. J., & Kemp, C. R. (2017). How Well Prepared Are Australian Preservice Teachers to Teach Early Reading Skills?. *Australian Journal of Teacher Education*, *42*(11), 1-17.

Melby-Lervåg, M., & Hulme, C. (2010). Serial and free recall in children can be improved by training: Evidence for the importance of phonological and semantic representations in immediate memory tasks. *Psychological science*, *21*(11), 1694-1700.

Melby-Lervåg, M., Lyster, S. A. H., & Hulme, C. (2012). Phonological skills and their role in learning to read: a meta-analytic review. *Psychological bulletin*, *138*(2), 322.

Meng, J., & Tajaroensuk, S. (2013). An investigation of tertiary EFL teachers' problems in their in-service professional development. *Journal of Language Teaching and Research, 4*(6), 1356–1364.

Mesmer, H. A. E., & Williams, T. O. (2015). Examining the role of syllable awareness in a model of concept of word: Findings from preschoolers. *Reading Research Quarterly*, *50*(4), 483-497.

Meyer, M. S., Wood, F. B., Hart, L. A., & Felton, R. H. (1998). Longitudinal course of rapid naming in disabled and nondisabled readers. *Annals of Dyslexia*, *48*(1), 89-114.

Mills, G. E. (2003). *Action research: A guide for the teacher researcher*. Prentice-Hall, Inc., One Lake Street, Upper Saddle River, New Jersey 07458.

Milton, J., & Treffers-Daller, J. (2013). Vocabulary size revisited: the link between vocabulary size and academic achievement. *Applied Linguistics Review*, *4*(1), 151-172.

Misra, M., Katzir, T., Wolf, M., & Poldrack, R. A. (2004). Neural systems for rapid automatized naming in skilled readers: Unraveling the RAN-reading relationship. *Scientific studies of reading*, *8*(3), 241-256.

Moats, L. (2009). Knowledge foundations for teaching reading and spelling. *Reading and Writing*, *22*(4), 379-399.

Moats, L. C. (1995). *Spelling: Development, disabilities, and instruction*. York Press.

Moats, L. C. (2005). How spelling supports reading. *American Educator*, *6*(12), 42-64.

MOE. (2011). *Standard English Curriculum in Compulsory Education*. Ministry of Education. Beijing.

Mokhtar, A. A., Rawian, R. M., Yahaya, M. F., Abdullah, A., & Mohamed, A. R. (2017). Vocabulary learning strategies of adult ESL learners. *The English Teacher*, 133-145.

Moll, K., Ramus, F., Bartling, J., Bruder, J., Kunze, S., Neuhoff, N., ... & Landerl, K. (2014). Cognitive mechanisms underlying reading and spelling development in five European orthographies. *Learning and instruction*, *29*, 65-77.

Morais, J., Alegría, J., & Content, A. (1987). The relationships between segmental analysis and alphabetic literacy: An interactive view. *Cahiers de psychologie cognitive*, *7*(5), 415-438.

Morris, D., Bloodgood, J. W., Lomax, R. G., & Perney, J. (2003). Developmental steps in learning to read: A longitudinal study in kindergarten and first grade. *Reading research quarterly*, *38*(3), 302-328.

Morris, L., & Cobb, T. (2004). Vocabulary profiles as predictors of the academic performance of Teaching English as a Second Language trainees. *System*, *32*(1), 75-87.

Müller, K., & Brady, S. (2001). Correlates of early reading performance in a transparent orthography. *Reading and Writing*, *14*(7), 757-799.

Munson, B., Kurtz, B. A., & Windsor, J. (2005). The influence of vocabulary size, phonotactic probability, and wordlikeness on nonword repetitions of children with and without specific language impairment. *Journal of Speech, Language, and Hearing Research, 48*(5), 1033-1047.

Murray, N. (2012). Ten 'Good Practice Principles'… ten key questions: Considerations in addressing the English language needs of higher education students. *Higher Education Research & Development*, *31*(2), 233-246.

Muter, V., Hulme, C., Snowling, M. J., & Stevenson, J. (2004). Phonemes, rimes, vocabulary, and grammatical skills as foundations of early reading development: evidence from a longitudinal study. *Developmental psychology*, *40*(5), 665-681.

Nag, S. (2011). The akshara languages: what do they tell us about children's literacy learning. In R. Mishra & N. Srinivassan (Eds.), *Language-cognition: state of the art* (pp. 272–290). Munich: Lincom.

Nagy, W., & Townsend, D. (2012). Words as tools: Learning academic vocabulary as language acquisition. *Reading research quarterly*, *47*(1), 91-108.

Nagy, W., Berninger, V. W., & Abbott, R. D. (2006). Contributions of morphology beyond phonology to literacy outcomes of upper elementary and middle-school students. *Journal of educational psychology*, *98*(1), 134-147.

Nanda, J. V. (2017). The L1 context embedding method in foreign language vocabulary instruction: A comparative study with the keyword method. *Channels: Where Disciplines Meet, 2*(1), 33-55.

Nation, P. (2001). *Learning vocabulary in another language*. Cambridge: England; Cambridge University Press.

National Early Literacy Panel. (2008). Developing early literacy: Report of the national early literacy panel. *National Institute for Literacy, Washington, DC*.

National Reading Panel. (2000). *Teaching children to read: An evidence-based assessment of the scientific research literature on reading and its implications for reading instruction: Reports of the subgroups*. National Institute of Child Health and Human Development, National Institutes of Health.

Nelson, J. R., Liu, Y., Fiez, J., & Perfetti, C. A. (2009). Assimilation and accommodation patterns in ventral occipitotemporal cortex in learning a second writing system. *Human brain mapping*, *30*(3), 810-820.

Ness, M. K. (2010). Examining one class of third-grade spellers: The diagnostic potential of students' spelling. *Reading Horizons: A Journal of Literacy and Language Arts*, *50*(2), 113-130.

Neuhaus, G., Foorman, B. R., Francis, D. J., & Carlson, C. D. (2001). Measures of information processing in rapid automatized naming (RAN) and their relation to reading. *Journal of experimental child psychology*, *78*(4), 359-373.

Niolaki, G. Z., & Masterson, J. (2013). Transfer effects in spelling from transparent Greek to opaque English in seven-to-ten-year-old children. *Bilingualism: Language and Cognition*, *15*(4), 757-770.

Nunan, D. (2003). The Impact of English as a Global Language on Educational Policies and Practices in the Asia-Pacific Region. *TESOL Quarterly, 37*(4): 589-613.

Oakhill, J. V., Cain, K., & Bryant, P. E. (2003). The dissociation of word reading and text comprehension: Evidence from component skills. *Language and cognitive processes*, *18*(4), 443-468.

Oakhill, J., Yuill, N., & Garnham, A. (2011). The differential relations between verbal, numerical and spatial working memory abilities and children's reading comprehension. *International Electronic Journal of Elementary Education*, *4*(1), 83-106.

Oliver, R., Vanderford, S., & Grote, E. (2012). Evidence of English language proficiency and academic achievement of non-English-speaking background students. *Higher Education Research & Development*, *31*(4), 541-555.

Ozturgut, O. (2011). Quality assurance in private higher education in China. *Current Issues in Education*, *14*(3), 1-9.

Pan, J., McBride-Chang, C., Shu, H., Liu, H., Zhang, Y., & Li, H. (2011). What is in the naming? A 5-year longitudinal study of early rapid naming and phonological sensitivity in relation to subsequent reading skills in both native Chinese and English as a second language. *Journal of educational psychology*, *103*(4), 897-908.

Pantelides, U. (1999). Meeting the language needs of tertiary NESB students. *The Australian Journal of Language and Literacy, 22*(1), 60-75.

Paribakht, T. S., & Wesche, M. (1997). Vocabulary enhancement activities and reading for meaning in second language vocabulary acquisition. *Second language vocabulary acquisition: A rationale for pedagogy*, *55*(4), 174-200.

Parrila, R., Kirby, J. R., & McQuarrie, L. (2004). Articulation rate, naming speed, verbal short-term memory, and phonological awareness: Longitudinal predictors of early reading development?. *Scientific studies of reading*, *8*(1), 3-26.

Pasquarella, A., Chen, X., Gottardo, A., & Geva, E. (2015). Cross-language transfer of word reading accuracy and word reading fluency in Spanish-English and Chinese-English bilinguals: Script-universal and script-specific processes. *Journal of Educational Psychology*, *107*(1), 96-110.

Pearson, W. S. (2020). The Effectiveness of Pre-sessional EAP Programmes in UK Higher Education: A Review of the Evidence. *Review of Education*, *8*(2), 420-447.

Peng, P., Barnes, M., Wang, C., Wang, W., Li, S., Swanson, H. L., Dardick, W., & Tao, S. (2018). A meta-analysis on the relation between reading and working memory. *Psychological Bulletin, 144*(1), 48–76

Pérez Cañado, M. L. (2005). English and Spanish spelling: Are they really different?. *The Reading Teacher*, *58*(6), 522-530.

Perfetti, C. A. (1997). *The psycholinguistics of spelling and reading.* In C. A. Perfetti, L. Rieben, & M. Fayol (Eds.), *Learning to spell: Research, theory, and practice across languages* (p. 21–38). Lawrence Erlbaum Associates Publishers.

Perfetti, C. A., & Dunlap, S. (2008). Learning to read: General principles and writing system variations. In *Learning to read across languages* (pp. 25-50). Routledge.

Perfetti, C. A., & Liu, Y. (2005). Orthography to phonology and meaning: Comparisons across and within writing systems. *Reading and Writing*, *18*(3), 193-210.

Perfetti, C. A., & Marron, M. A. (1998). Learning to Read: Literacy Acquisition by Children and Adults. In D. A. Wagner (Ed.), *Advances in Adult Literacy Research and Development* (pp. 89-138). Philadelphia, PA: Hampton Press.

Perfetti, C. A., & Tan, L. H. (1998). The constituency model of Chinese word identification. In *Reading chinese script* (pp. 127-146). Psychology Press.

Perfetti, C. A., & Zhang, S. (1995). Very early phonological activation in Chinese reading. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, *21*(1), 24-33.

Perfetti, C. A., Landi, N., & Oakhill, J. (2005). The acquisition of reading comprehension skill. *The science of reading: A handbook*, 227-247.

Perfetti, C. A., Liu, Y., & Tan, L. H. (2005). The lexical constituency model: some implications of research on Chinese for general theories of reading. *Psychological review*, *112*(1), 43-59.

Perfetti, C. A., Zhang, S., & Berent, I. (1992). Reading in English and Chinese: Evidence for a "universal" phonological principle. In *Advances in psychology* (Vol. 94, pp. 227-248). North-Holland.

Phakiti, A. (2008). Predicting NESB international postgraduate students' academic achievement: a structural equation modelling approach. *International Journal of Applied Educational Studies*, *3*(1), 18-38.

Pham, A. V., & Hasson, R. M. (2014). Verbal and visuospatial working memory as predictors of children's reading ability. *Archives of Clinical Neuropsychology*, *29*(5), 467-477.

Phillips, B. M., Clancy-Menchetti, J., & Lonigan, C. J. (2008). Successful phonological awareness instruction with preschool children: Lessons from the classroom. *Topics in early childhood special education*, *28*(1), 3-17.

Pikulski, J. J., & Chard, D. J. (2005). Fluency: Bridge between decoding and reading comprehension. *The Reading Teacher*, *58*(6), 510-519.

Pinto, G., Bigozzi, L., Tarchi, C., Gamannossi, B. A., & Canneti, L. (2015). Cross-lag analysis of longitudinal associations between primary school students' writing and reading skills. *Reading and Writing*, *28*(8), 1233-1255.

Pittman, R. T., Joshi, R. M., & Carreker, S. (2014). Improving the spelling ability among speakers of African American English through explicit instruction. *Literacy Research and Instruction*, *53*(2), 107-133.

Plonsky, L., & Oswald, F. L. (2014). How big is “big”? Interpreting effect sizes in L2 research. *Language Learning*, *64*(4), 878-912.

Ponniah, R. J. (2011). Incidental acquisition of vocabulary by reading. *The Reading Matrix, 11*(2), 135-139.

Powell, D., Stainthorp, R., Stuart, M., Garwood, H., & Quinlan, P. (2007). An experimental comparison between rival theories of rapid automatized naming performance and its relationship to reading. *Journal of experimental child psychology*, *98*(1), 46-68.

Proctor, C. P., Carlo, M., August, D., & Snow, C. (2005). Native Spanish-speaking children reading in English: Toward a model of comprehension. *Journal of Educational Psychology*, *97*(2), 246-256.

Protopapas, A. (2007). Check Vocal: A program to facilitate checking the accuracy and response time of vocal responses from DMDX. *Behavior research methods*, *39*(4), 859-862.

Qi, G. Y. (2016). The importance of English in primary school education in China: perceptions of students. *Multilingual Education*, *6*(1), 1-18.

Qian, D. D. (2002). Investigating the relationship between vocabulary knowledge and academic reading performance: An assessment perspective. *Language learning*, *52*(3), 513-536.

Quiroga, T., Lemos-Britton, Z., Mostafapour, E., Abbott, R. D., & Berninger, V. W. (2002). Phonological awareness and beginning reading in Spanish-speaking ESL first graders: Research into practice. *Journal of School Psychology*, *40*(1), 85-111.

Quiroga, T., Lemos-Britton, Z., Mostafapour, E., Abbott, R. D., & Berninger, V. W. (2002). Phonological awareness and beginning reading in Spanish-speaking ESL first graders: Research into practice. *Journal of School Psychology*, *40*(1), 85-111.

Ramus, F., Marshall, C. R., Rosen, S., & Van Der Lely, H. K. (2013). Phonological deficits in specific language impairment and developmental dyslexia: Towards a multidimensional 2model. *Brain*, *136*(2), 630-645.

Rayner, K., Foorman, B. R., Perfetti, C. A., Pesetsky, D., & Seidenberg, M. S. (2001). How psychological science informs the teaching of reading. *Psychological science in the public interest*, *2*(2), 31-74.

Read, C. (1971). Pre-school children's knowledge of English phonology. *Harvard educational review*, *41*(1), 1-34.

Read, C., Zhang, Y. F., Nie, H. Y., & Ding, B. Q. (1986). The ability to manipulate speech sounds depends on knowing alphabetic writing. *Cognition*, *24*, 31–44.

Redden, E. (2014). *Teaching international students.* http://cf2015.bhcarroll.edu/files/session-2-toward-a-learning-century/teaching-international-students.pdf

Richards, J. C., Richards, J. C., & Renandya, W. A. (2002). *Methodology in language teaching: An anthology of current practice*. Cambridge university press.

Richardson, J. T. (2011). Eta squared and partial eta squared as measures of effect size in educational research. *Educational research review*, *6*(2), 135-147.

Roche, T., & Harrington, M. (2013). Recognition vocabulary knowledge as a predictor of academic performance in an English as a foreign language setting. *Language Testing in Asia*, *3*(1), 1-13.

Rolstad, K., Mahoney, K., & Glass, G. V. (2005). The big picture: A meta-analysis of program effectiveness research on English language learners. *Educational policy*, *19*(4), 572-594.

Roman, A. A., Kirby, J. R., Parrila, R. K., Wade-Woolley, L., & Deacon, S. H. (2009). Toward a comprehensive view of the skills involved in word reading in Grades 4, 6, and 8. *Journal of experimental child psychology*, *102*(1), 96-113.

Romani, C., Ward, J., & Olson, A. (1999). Developmental surface dysgraphia: What is the underlying cognitive impairment?. *The Quarterly Journal of Experimental Psychology Section A*, *52*(1), 97-128.

Rossell, C. H., & Baker, K. (1996). The educational effectiveness of bilingual education. *Research in the Teaching of English*, 7-74.

Ruan, Y., Georgiou, G. K., Song, S., Li, Y., & Shu, H. (2018). Does writing system influence the associations between phonological awareness, morphological awareness, and reading? A meta-analysis. *Journal of Educational Psychology*, *110*(2), 180-202.

Sabourin, L., Stowe, L. A., & De Haan, G. J. (2006). Transfer effects in learning a second language grammatical gender system. *Second Language Research*, *22*(1), 1-29.

Sagarra, N., & Alba, M. (2006). The key is in the keyword: L2 vocabulary learning methods with beginning learners of Spanish. *The modern language journal*, *90*(2), 228-243.

Saksida, A., Iannuzzi, S., Bogliotti, C., Chaix, Y., Démonet, J.-F., Bricout, L., Billard, C., Nguyen-Morel, M.-A., Le Heuzey, M.-F., Soares-Boucaud, I., George, F., Ziegler, J. C., & Ramus, F. (2016). Phonological skills, visual attention span, and visual stress in developmental dyslexia. *Developmental psychology*, *52*(10), 1503-1516.

San Francisco, A. R., Mo, E., Carlo, M., August, D., & Snow, C. (2006). The influences of language of literacy instruction and vocabulary on the spelling of Spanish–English bilinguals. *Reading and Writing*, *19*(6), 627-642.

Savage, R. S., Frederickson, N., Goodwin, R., Patni, U., Smith, N., & Tuersley, L. (2005). Relationships among rapid digit naming, phonological processing, motor automaticity, and speech perception in poor, average, and good readers and spellers. *Journal of learning disabilities*, *38*(1), 12-28.

Savage, R., Lavers, N., & Pillay, V. (2007). Working memory and reading difficulties: What we know and what we don't know about the relationship. *Educational psychology review*, *19*(2), 185-221.

Scarcella, R. (2002). Some key factors affecting English learners' development of advanced literacy. *Developing advanced literacy in first and second languages: Meaning with power*, 209-226.

Schlagal, B. (2007). Best practices in spelling and handwriting. *Best practices in writing instruction*, 179-201.

Schleppegrell, M. J. (2004). *The language of schooling: A functional linguistics perspective*. Routledge.

Schmitt, N. (2007). Current perspectives on vocabulary teaching and learning. *International handbook of English language teaching*, 827-841.

Seymour, P. H. (2006). Theoretical framework for beginning reading in different orthographies. *Handbook of orthography and literacy*, 441-462.

Seymour, P. H., Aro, M., Erskine, J. M., & Collaboration with COST Action A8 Network. (2003). Foundation literacy acquisition in European orthographies. *British Journal of psychology*, *94*(2), 143-174.

Shahrzad, A., & Derakhshan, A. (2011). The effect of instruction in deriving word meaning on incidental vocabulary learning in EFL context. *World Journal of English Language*, *1*(1), 68-79.

Shanahan, T. (2006). Relations among oral language, reading, and writing development. In *Handbook of writing research*, Edited by: MacArthur, C. A., Graham, S. and Fitzgerald, J. 171–183. New York, NY: Guildford Press.

Shanahan, T., & Beck, I. L. (2006). Effective Literacy Teaching for English-Language Learners. In D. August & T. Shanahan (Eds.), *Developing literacy in second-language learners: Report of the National Literacy Panel on Language-Minority Children and Youth* (pp. 415–488). Lawrence Erlbaum Associates Publishers.

Shapiro, A. M., & Waters, D. L. (2005). An investigation of the cognitive processes underlying the keyword method of foreign vocabulary learning. *Language teaching research*, *9*(2), 129-146.

Share, D. L. (1995). Phonological recoding and self-teaching: Sine qua non of reading acquisition. *Cognition*, *55*(2), 151-218.

Share, D. L. (2004). Orthographic learning at a glance: On the time course and developmental onset of self-teaching. *Journal of experimental child psychology*, *87*(4), 267-298.

Share, D. L. (2008). Orthographic learning, phonological recoding, and self-teaching. In *Advances in child development and behavior* (Vol. 36, pp. 31-82). JAI.

Sharifian, F. (2013). Globalisation and developing metacultural competence in learning English as an International Language. *Multilingual Education*, *3*(1), 1-11.

Shen, H. H. (2014). Chinese L2 literacy debates and beginner reading in the United States. In *The Routledge handbook of educational linguistics* (pp. 298-310). Routledge.

Sheslow, D., & Adams, W. (2003). *Wide Range Assessment of Memory and Learning, Second Edition (WRAML 2)*. Wide Range Incorporated.

Shu, H., Chen, X., Anderson, R. C., Wu, N., & Xuan, Y. (2003). Properties of school Chinese: implications for learning to read. *Child Development, 74*(1), 27–47.

Shu, H., McBride-Chang, C., Wu, S., & Liu, H. (2006). Understanding Chinese developmental dyslexia: morphological awareness as a core cognitive construct. *Journal of educational psychology*, *98*(1), 122-133.

Siegel, L. S. (1993) The cognitive basis of dyslexia. *Emerging themes in cognitive development*, *2*, 33-52.

Siok, W. T., & Fletcher, P. (2001). The role of phonological awareness and visual-orthographic skills in Chinese reading acquisition. *Developmental psychology*, *37*(6), 886–899.

Siok, W. T., & Fletcher, P. (2001). The role of phonological awareness and visual-orthographic skills in Chinese reading acquisition. *Developmental psychology*, *37*(6), 886-899.

Slavin, R. E., & Cheung, A. (2005). A synthesis of research on language of reading instruction for English language learners. *Review of educational research*, *75*(2), 247-284.

Sloan, D., & Porter, E. (2010). Changing international student and business staff perceptions of in-sessional EAP: using the CEM model. *Journal of English for Academic Purposes*, *9*(3), 198-210.

Smith, B. L., Macaluso, C., & Brown-Sweeney, S. (1991). Phonological effects shown by normal adult speakers learning new words: Implications for phonological development. *Applied Psycholinguistics*, *12*(3), 281-298.

Snyder, E., Witmer, S. E., & Schmitt, H. (2017). English language learners and reading instruction: A review of the literature. *Preventing School Failure: Alternative Education for Children and Youth*, *61*(2), 136-145.

Spinks, J. A., Liu, Y., Perfetti, C. A., & Tan, L. H. (2000). Reading Chinese characters for meaning: The role of phonological information. *Cognition*, *76*(1), B1-B11.

Sprenger-Charolles, L., Siegel, L. S., & Bonnet, P. (1998). Reading and spelling acquisition in French: The role of phonological mediation and orthographic factors. *Journal of experimental child psychology*, *68*(2), 134-165.

Stahl, S. A., & Nagy, W. E. (2007). *Teaching word meanings*. Routledge.

Stanovich, K. E., & Siegel, L. S. (1994). Phenotypic performance profile of children with reading disabilities: A regression-based test of the phonological-core variable-difference model. *Journal of educational psychology*, *86*(1), 24-53.

Stanovich, K. E., & West, R. F. (1989). Exposure to print and orthographic processing. *Reading research quarterly*, 402-433.

Stappen, C. V., & Reybroeck, M. V. (2018). Phonological awareness and rapid automatized naming are independent phonological competencies with specific impacts on word reading and spelling: an intervention study. *Frontiers in psychology*, *9*, 320-336.

Stuart, M. (1990). Processing strategies in a phoneme deletion task. *The Quarterly Journal of Experimental Psychology*, *42*(2), 305-327.

Suggate, S. P. (2016). A meta-analysis of the long-term effects of phonemic awareness, phonics, fluency, and reading comprehension interventions. *Journal of learning disabilities*, *49*(1), 77-96.

Sun-Alperin, M. K., & Wang, M. (2011). Cross-language transfer of phonological and orthographic processing skills from Spanish L1 to English L2. *Reading and Writing*, *24*(5), 591-614.

Sun, B., Zhou, H., & Zhu, B. (2013). Effects of English phonological awareness training on Chinese child EFL learners' literacy development. *Canadian Social Science*, *9*(1), 56-64.

Sun, K. K., & Kemp, C. (2006). The acquisition of phonological awareness and its relationship to reading in individuals with intellectual disabilities. *Australasian Journal of Special Education*, *30*(1), 86-99.

Swanson, H. L. (1999). Reading comprehension and working memory in learning-disabled readers: Is the phonological loop more important than the executive system?. *Journal of Experimental Child Psychology*, *72*(1), 1-31.

Swanson, H. L. (2003). Age-related differences in learning disabled and skilled readers' working memory. *Journal of experimental child psychology*, *85*(1), 1-31.

Swanson, H. L., & Howell, M. (2001). Working memory, short-term memory, and speech rate as predictors of children's reading performance at different ages. *Journal of Educational Psychology*, *93*(4), 720-734.

Swanson, H. L., & O'Connor, R. (2009). The role of working memory and fluency practice on the reading comprehension of students who are dysfluent readers. *Journal of Learning Disabilities*, *42*(6), 548-575.

Szenkovits, G., & Ramus, F. (2005). Exploring dyslexics' phonological deficit I: lexical vs sub-lexical and input vs output processes. *Dyslexia*, *11*(4), 253-268.

Szenkovits, G., & Ramus, F. (2005). Exploring dyslexics' phonological deficit: lexical vs sub-lexical and input vs output processes. *Dyslexia*, *11*(4), 253-268.

Tabachnick, B. G., Fidell, L. S., & Ullman, J. B. (2007). *Using multivariate statistics* (7th ed.). Boston, MA: Pearson.

Taft, M., Zhu, X., & Peng, D. (1999). Positional specificity of radicals in Chinese character recognition. *Journal of memory and Language*, *40*(4), 498-519.

Tainturier, M. J. (2019) 'BAST: a Theory of Bilingual Spelling in Alphabetic Systems'. In *Spelling and Writing Words* (pp. 67-92). BRILL

Tan, L. H., & Perfetti, C. A. (1999). Phonological activation in visual identification of Chinese two-character words. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, *25*(2), 382-393.

Tan, L. H., Spinks, J. A., Eden, G. F., Perfetti, C. A., & Siok, W. T. (2005). Reading depends on writing, in Chinese. *Proceedings of the National Academy of Sciences*, *102*(24), 8781-8785.

Tang, C. & Biggs, J. (1998). Assessment by portfolio. In D. Watkins, C. Tang, J. Biggs & R. Kuisma. *Assessment of university students in Hong Kong: how and why, assessment portfolio, students' grading*. Evaluation of the Student Experience Project.

Templeton, S., & Bear, D. (2018). Word study, research to practice: Spelling, phonics, meaning. *Handbook of research on teaching the English language arts*, 206-231.

Templeton, S., & Morris, D. (2000). Spelling. *Handbook of reading research*, *3*, 525-543.

Thompkins, A. C., & Binder, K. S. (2003). A comparison of the factors affecting reading performance of functionally illiterate adults and children matched by reading level. *Reading Research Quarterly*, *38*(2), 236-258.

Thorpe, A., Snell, M., Davey-Evans, S., & Talman, R. (2017). Improving the academic performance of non-native English-speaking students: The contribution of pre-sessional English language programmes. *Higher Education Quarterly*, *71*(1), 5-32.

Tian, M., & Lowe, J. (2009). Existentialist internationalisation and the Chinese student experience in English universities. *Compare*, *39*(5), 659-676.

Tighe, E. L., Little, C. W., Arrastia-Chisholm, M. C., Schatschneider, C., Diehm, E., Quinn, J. M., & Edwards, A. A. (2019). Assessing the direct and indirect effects of metalinguistic awareness to the reading comprehension skills of struggling adult readers. *Reading and Writing*, *32*(3), 787-818.

Tong, X., & McBride-Chang, C. (2010). Developmental models of learning to read Chinese words. *Developmental Psychology*, *46*(6), 1662-1676.

Tong, X., McBride-Chang, C., Shu, H., & Wong, A. M. (2009). Morphological awareness, orthographic knowledge, and spelling errors: Keys to understanding early Chinese literacy acquisition. *Scientific Studies of Reading*, *13*(5), 426-452.

Tong, X., Tong, X., & McBride, C. (2017). Unpacking the relation between morphological awareness and Chinese word reading: Levels of morphological awareness and vocabulary. *Contemporary Educational Psychology*, *48*, 167-178.

Torgesen, J. K. (2000). Individual differences in response to early interventions in reading: The lingering problem of treatment resisters. *Learning disabilities research & practice*, *15*(1), 55-64.

Torppa, M., Georgiou, G. K., Lerkkanen, M. K., Niemi, P., Poikkeus, A. M., & Nurmi, J. E. (2016). Examining the simple view of reading in a transparent orthography: A longitudinal study from kindergarten to grade 3. *Merrill-Palmer Quarterly (1982-)*, *62*(2), 179-206.

Treiman, R., & Bourassa, D. C. (2000). The development of spelling skill. *Topics in language disorders*, *20*(3), 1-18.

Treiman, R., & Kessler, B. (2014). *How children learn to write words*. Oxford University Press.

Treiman, R., Cassar, M., & Zukowski, A. (1994). What types of linguistic information do children use in spelling? The case of flaps. *Child development*, *65*(5), 1318-1337.

Treiman, R., Kessler, B., Pollo, T. C., Byrne, B., & Olson, R. K. (2016). Measures of kindergarten spelling and their relations to later spelling performance. *Scientific Studies of Reading*, *20*(5), 349-362.

Trenkic, D., & Warmington, M. (2019). Language and literacy skills of home and international university students: How different are they, and does it matter?. *Bilingualism: Language and Cognition*, *22*(2), 349-365.

Tunmer, W. E., Chapman, J. W., Ryan, H. A., & Prochnow, J. E. (1998). The importance of providing beginning readers with explicit training in phonological processing skills. *Australian journal of learning difficulties*, *3*(2), 4-14.

Turner, C. S. V. , & Garcia, E. E. (2005). Latina and Latino students in higher education: Enhancing access, participation, and achievement. *Journal of Hispanic Higher Education, 4*(3), 178-180.

Universities UK. (2014). *International students in higher education: The UK and its competition.* https://www.universitiesuk.ac.uk/policy-and-analysis/reports/Documents/2014/international-students-in-higher-education.pdf

Vadasy, P. F., & Sanders, E. A. (2015). Incremental learning of difficult words in story contexts: The role of spelling and pronouncing new vocabulary. *Reading and Writing*, *28*(3), 371-394.

Vadasy, P. F., & Sanders, E. A. (2016). Attention to orthographic and phonological word forms in vocabulary instruction for kindergarten English learners. *Reading Psychology*, *37*(6), 833-866.

van den Boer, M., Georgiou, G. K., & de Jong, P. F. (2016). Naming of short words is (almost) the same as naming of alphanumeric symbols: Evidence from two orthographies. *Journal of Experimental Child Psychology*, *144*, 152-165.

Van den Bos, K. P., Zijlstra, B. J., & lutje Spelberg, H. C. (2002). Life-span data on continuous-naming speeds of numbers, letters, colors, and pictured objects, and word-reading speed. *Scientific Studies of Reading*, *6*(1), 25-49.

Vecchi, T., & Cornoldi, C. (1999). Passive storage and active manipulation in visuo-spatial working memory: Further evidence from the study of age differences. *European Journal of Cognitive Psychology*, *11*(3), 391-406.

Vecchi, T., Richardson, J., & Cavallini, E. (2005). Passive storage versus active processing in working memory: Evidence from age-related variations in performance. *European Journal of Cognitive Psychology*, *17*(4), 521-539.

Vellutino, F. R., Fletcher, J. M., Snowling, M. J., & Scanlon, D. M. (2004). Specific reading disability (dyslexia): What have we learned in the past four decades?. *Journal of child psychology and psychiatry*, *45*(1), 2-40.

Wagner, D. A., & Venezky, R. L. (1999). Adult literacy: The next generation. *Educational researcher*, *28*(1), 21-29.

Wagner, R. K., & Torgesen, J. K. (1987). The nature of phonological processing and its causal role in the acquisition of reading skills. *Psychological bulletin*, *101*(2), 192-212.

Wagner, R. K., Torgesen, J. K., & Rashotte, C. A. (1994). Development of reading-related phonological processing abilities: New evidence of bidirectional causality from a latent variable longitudinal study. *Developmental psychology*, *30*(1), 73-87.

Wagner, R. K., Torgesen, J. K., Rashotte, C. A., & Pearson, N. A. (2013). *Comprehensive Test of Phonological Processing: CTOPP2*. Pro-ed.

Wagner, R. K., Torgesen, J. K., Rashotte, C. A., Hecht, S. A., Barker, T. A., Burgess, S. R., Donahue, J & Garon, T. (1997). Changing relations between phonological processing abilities and word-level reading as children develop from beginning to skilled readers: a 5-year longitudinal study. *Developmental psychology*, *33*(3), 468-479.

Wang, M., & Geva, E. (2003). Spelling performance of Chinese children using English as a second language: Lexical and visual–orthographic processes. *Applied Psycholinguistics*, *24*(1), 1-25.

Wang, M., Cheng, C., & Chen, S. W. (2006). Contribution of morphological awareness to Chinese-English biliteracy acquisition. *Journal of Educational Psychology*, *98*(3), 542-553.

Wang, M., Koda, K., & Perfetti, C. A. (2003). Alphabetic and nonalphabetic L1 effects in English word identification: A comparison of Korean and Chinese English L2 learners. *Cognition*, *87*(2), 129-149.

Wang, M., Perfetti, C. A., & Liu, Y. (2005). Chinese–English biliteracy acquisition: Cross-language and writing system transfer. *Cognition*, *97*(1), 67-88.

Wang, Q. (2007). The national curriculum changes and their effects on English language teaching in the People's Republic of China. In *International handbook of English language teaching* (pp. 87-105). Springer, Boston, MA.

Wang, W. (2015). Teaching English as an international language in China: Investigating university teachers' and students' attitudes towards China English. *System*, *53*, 60-72.

Wanzek, J., & Vaughn, S. (2007). Research-based implications from extensive early reading interventions. *School Psychology Review*, *36*(4), 541-561.

Waring, R., & Nation, I. S. (2004). Second language reading and incidental vocabulary learning. *Angles on the English speaking world*, *4*, 97-110.

Waring, R., & Takaki, M. (2003). At what rate do learners learn and retain new vocabulary from reading a graded reader? *Reading in a Foreign Language*, *15*, 130-163.

Watty, K. (2007). Quality in accounting education and low English standards among overseas students: is there a link?. *People and Place*, *15*(1), 22-29.

Weber-Fox, C., & Neville, H. J. (2001). Sensitive periods differentiate processing of open-and closed-class words. *Journal of Speech, Language, and Hearing Research, 44*(6), 1338-1353.

Wei, Z. (2015). Does teaching mnemonics for vocabulary learning make a difference? Putting the keyword method and the word part technique to the test. *Language Teaching Research*, *19*(1), 43-69.

Wei, T. Q., Bi, H. Y., Chen, B. G., Liu, Y., Weng, X. C., & Wydell, T. N. (2014). Developmental changes in the role of different metalinguistic awareness skills in Chinese reading acquisition from preschool to third grade. *PloS one*, *9*(5), 1-11.

Wesche, M. B., & Paribakht, T. S. (2000). Reading-based exercises in second language vocabulary learning: An introspective study. *The Modern Language Journal*, *84*(2), 196-213.

Westwood, P. S. (2008). *What teachers need to know about reading and writing difficulties*. Aust Council for Ed Research.

White, S., Frith, U., Milne, E., Rosen, S., Swettenham, J., & Ramus, F. (2006). A double dissociation between sensorimotor impairments and reading disability: A comparison of autistic and dyslexic children. *Cognitive Neuropsychology*, *23*(5), 748-761.

Wilkinson, G. S., & Robertson, G. J. (2006) *WRAT 4: Wide range achievement test; professional manual*. Psychological Assessment Resources, Incorporated.

Williams, K. J., Walker, M. A., Vaughn, S., & Wanzek, J. (2017). A synthesis of reading and spelling interventions and their effects on spelling outcomes for students with learning disabilities. *Journal of learning disabilities*, *50*(3), 286-297.

Wilson, B. A. (2004). *Wilson Reading System: Student Reader. Three*. Wilson Language Training Corporation.

Wimmer, H., Mayringer, H., & Landerl, K. (2000). The double-deficit hypothesis and difficulties in learning to read a regular orthography. *Journal of educational psychology*, *92*(4), 668-680.

Wingate, U. (2006). Doing away with 'study skills'. *Teaching in higher education*, *11*(4), 457-469.

Wolf, M., & Bowers, P. G. (1999). The double-deficit hypothesis for the developmental dyslexias. *Journal of educational psychology*, *91*(3), 415-438.

Wolff, U. (2014). RAN as a predictor of reading skills, and vice versa: Results from a randomised reading intervention. *Annals of Dyslexia*, *64*(2), 151-165.

Wolter, J. A., Wood, A., & D'zatko, K. (2009). The influence of morphological awareness onfirst-grade children's literacy development. *Language, Speech, and Hearing Services in theSchools*, *40*(3), 1-13.

Wright, S., & Zheng, L. (2016). English in Chinese higher education: past difficulties, current initiatives and future challenges. *Journal of World Languages*, *3*(3), 167-183.

Xue, J., & Jiang, X. (2017). The developmental relationship between bilingual morphological awareness and reading for Chinese EFL adult learners: a longitudinal study. *Reading and Writing*, *30*(2), 417-438.

Yan, C. (2015). 'We can't change much unless the exams change': Teachers' dilemmas in the curriculum reform in China. *Improving Schools*, *18*(1), 5-19.

Yang, M., Cooc, N., & Sheng, L. (2017). An investigation of cross-linguistic transfer between Chinese and English: A meta-analysis. *Asian-Pacific Journal of Second and Foreign Language Education*, *2*(1), 1-21.

Yeong, S. H., & Liow, S. J. R. (2012). Development of phonological awareness in English–Mandarin bilinguals: A comparison of English–L1 and Mandarin–L1 kindergarten children. *Journal of experimental child psychology*, *112*(2), 111-126.

Yeong, S. H., Fletcher, J., & Bayliss, D. M. (2014). Importance of phonological and orthographic skills for English reading and spelling: A comparison of English monolingual and Mandarin-English bilingual children. *Journal of Educational Psychology*, *106*(4), 1107-1121.

Yeong, S. H., Fletcher, J., & Bayliss, D. M. (2017). Impact of early home language exposure on phonological and orthographic skills and their contributions to English literacy abilities in English monolingual and Chinese–English bilingual adults. *Applied Psycholinguistics*, *38*(1), 181-210.

Yeung, P. S., Ho, C. S. H., Chik, P. P. M., Lo, L. Y., Luan, H., Chan, D. W. O., & Chung, K. K. H. (2011). Reading and spelling Chinese among beginning readers: What skills make a difference?. *Scientific Studies of Reading*, *15*(4), 285-313.

Yeung, S. S., Siegel, L. S., & Chan, C. K. (2013). Effects of a phonological awareness program on English reading and spelling among Hong Kong Chinese ESL children. *Reading and writing*, *26*(5), 681-704.

Yihong, G., Ying, C., Yuan, Z., & Yan, Z. (2005). Self-identity changes and English learning among Chinese undergraduates. *World Englishes*, *24*(1), 39-51.

Yin, L., Anderson, R. C., & Zhu, J. (2007). Stages in Chinese children's reading of English words. *Journal of Educational Psychology*, *99*(4), 852-866.

Yongbing, L. (2005). A pedagogy for digraphia: An analysis of the impact of Pinyin on literacy teaching in China and its implications for curricular and pedagogical innovations in a wider community. *Language and Education*, *19*(5), 400-414.

Yu, H. (2016). *Chinese undergraduate students' academic coping and approaches to studying in the UK—a longitudinal study of four individual cases* [Doctoral dissertation, University of Portsmouth]. https://pure.port.ac.uk/ws/portalfiles/portal/7688526/Hua_Yu_Hua_Knight_PhD_Thesis_16.05.17.pdf

Yu, J. (2004). Problems and strategies of teaching English in large college classes. *Journal of Chongqing University of Post and Telecommunication 3*(1), 139-140.

Zhang, Y., Tardif, T., Shu, H., Li, H., Liu, H., McBride-Chang, C., ... & Zhang, Z. (2013). Phonological skills and vocabulary knowledge mediate socioeconomic status effects in predicting reading outcomes for Chinese children. *Developmental psychology*, *49*(4), 665-671.

Zhao, C. (1993). *Perceived English language needs of international graduate students at the University of Alberta.* [Master thesis, University of Alberta]. National Library of Canada. https://era.library.ualberta.ca/items/903b0a84-72e0-4585-a916-ad20dabf95d1/view/66a0a967-e605-4c7d-ac2c-f7250f7ad196/MM88095.pdf

Zhao, J., Joshi, R. M., Dixon, L. Q., & Chen, S. (2017). Contribution of phonological, morphological and orthographic awareness to English word spelling: A comparison of EL1 and EFL models. *Contemporary Educational Psychology*, *49*, 185-194.

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

Zhou, W., Xia, Z., Georgiou, G. K., & Shu, H. (2018). The distinct roles of dorsal and ventral visual systems in naming of Chinese characters. *Neuroscience*, *390*, 256-264.

Zhou, Y. L., McBride-Chang, C., Fong, C. Y.-C., Wong, T. T.-Y., & Cheung, S. K. (2012). A comparison of phonological awareness, lexical compounding, and homophone training for Chinese word reading in Hong Kong kindergarteners. *Early Education and Development, 23*(4), 475–492.

Zhu, X. (1988). Analysis of cueing function of phonetic components in modern Chinese. In *Proceedings of the Symposium on the Chinese Language and Characters* (pp. 85-99). Beijing: Guang Ming Daily Press.

Ziegler, J. C., & Goswami, U. (2005). Reading acquisition, developmental dyslexia, and skilled reading across languages: a psycholinguistic grain size theory. *Psychological bulletin*, *131*(1), 3-29.