



Faculty of Cognitive Sciences and Human Development

**The Relationship of Handwriting, Spelling and Word Reading Accuracy
Among Multilingual Primary 1 Poor Readers**

Joanna Wang Joo Ying

**Master of Science
2023**

The Relationship of Handwriting, Spelling and Word Reading Accuracy
among Multilingual Primary 1 Poor Readers

Joanna Wang Joo Ying

A thesis submitted

In fulfillment of the requirements for the degree of Master of Science

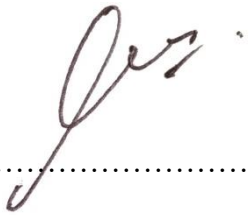
Faculty of Cognitive Sciences and Human Development

UNIVERSITI MALAYSIA SARAWAK

2023

DECLARATION

I declare that the work in this thesis was carried out in accordance with the regulations of Universiti Malaysia Sarawak. Except where due acknowledgements have been made, the work is that of the author alone. The thesis has not been accepted for any degree and is not concurrently submitted in candidature of any other degree.



.....

Signature

Name: Joanna Wang Joo Ying

Matric No.: 20020104

Faculty of Cognitive Sciences and Human Development

Universiti Malaysia Sarawak

Date : 22.05.2023

ACKNOWLEDGEMENT

I would like to praise God for leading this work to completion. His faithfulness and unfailing love have given me the strength to persevere in every milestone of this journey. I have always believed that God is able to do exceedingly abundantly beyond what I ask or imagine. With God, all things are possible.

It is a genuine pleasure to express my deepest gratitude to my supervisor and mentor, Associate Professor Dr Julia Lee Ai Cheng. Her passion for education, patience, enthusiasm, meticulous scrutiny, timely words of encouragement and prompt inspiration have led me to the completion of my thesis. It has been an honour to work with her all these years.

I also thank profusely all the staff of the Faculty of Cognitive Sciences and Human Development as well as the Centre for Graduate Studies, for the advice and endless support given during my period of study in Universiti Malaysia Sarawak.

Last, but not the least, I am greatly indebted to my family and friends – my parents, Kee Teng and Doreen; my sisters, Audrey and Cynthia; my partner, Irwin; my best friend, Andyriene; my relatives, church family and graduate peers. Their love and support have kept me going and this thesis would not have been possible without them.

ABSTRACT

This study aimed to investigate the relationship of handwriting, spelling and word reading accuracy among multilingual Primary 1 poor readers. A total of 866 Year 1 Malaysian government school students from various demographic and multilingual backgrounds participated in the research. Students with poor reading skills were classified according to percentile scores with the 25th percentile and below as the cut-off point. The reading (word reading accuracy), spelling (phonological coding) and handwriting (name and letter writing) outcomes were analysed. The findings show that a majority of poor readers, respectively in Malay and English, had poor handwriting and spelling skills. Spelling was a better indicator for identifying reading difficulties due to its high correlations with reading performance. Additionally, both poor readers and spellers correspondingly showed poor reading and spelling performances in both languages. These findings are useful for developing more appropriate tools to identify reading difficulties among Malaysian learners. Future directions and implications for practice are addressed.

Keywords: Reading difficulties; spelling; handwriting; Malay; English.

Peranan Tulisan Tangan dan Ejaan dalam Mengenal Pasti Kesukaran Membaca dalam Kalangan Murid Multilingual

ABSTRAK

Kajian ini mengetengahkan hubungan antara tulisan tangan, ejaan dan ketepatan bacaan perkataan dalam kalangan murid multilingual Darjah 1 yang lemah dalam pembacaan. Seramai 866 murid Darjah 1 sekolah kebangsaan yang berlatar belakang demografi pelbagai serta multilingual telah mengambil bahagian dalam kajian ini. Persentil ke-25 dan ke bawah telah digunakan sebagai aras penentu untuk mengkategorikan murid-murid yang mempunyai kesukaran dalam kemahiran membaca. Kemahiran membaca (ketepatan bacaan perkataan), ejaan (pengekodan fonologi) dan tulisan tangan (penulisan nama dan huruf) telah dianalisis. Hasil kajian menunjukkan bahawa ejaan adalah petunjuk yang lebih bagus untuk mengenal pasti kesukaran membaca, kerana ejaan mempunyai korelasi yang lebih tinggi dengan prestasi membaca. Selain itu, pembaca dan pengeja yang lemah masing-masing juga menunjukkan prestasi membaca dan mengeja yang lemah dalam kedua-dua bahasa. Dapatan kajian ini berpotensi untuk menghasilkan alat yang lebih sesuai untuk mengenal pasti kesukaran membaca dalam kalangan murid di Malaysia. Halatuju masa depan penyelidikan serta implikasinya telah dibincangkan.

Kata kunci: Kesukaran pembacaan; ejaan; tulisan tangan; Bahasa Melayu; Bahasa Inggeris.

TABLE OF CONTENTS

	Page
DECLARATION	i
ACKNOWLEDGEMENT	ii
ABSTRACT	iii
ABSTRAK	iv
TABLE OF CONTENTS	v
LIST OF TABLES	x
LIST OF FIGURES	xi
LIST OF ABBREVIATIONS	xii
CHAPTER 1 INTRODUCTION	1
1.1 Study Background	1
1.2 Problem Statement	1
1.3 Research Objectives	4
1.4 Research Questions	5
1.5 Significance of The Study	5
1.6 Conceptual Framework	6
1.7 Conceptual and Operational Definitions	7
1.7.1 Handwriting	7
1.7.2 Spelling	7

1.7.3	Word Reading Accuracy	7
1.7.4	Multilingual	8
1.7.5	Poor Readers	8
CHAPTER 2 LITERATURE REVIEW		9
2.1	Introduction	9
2.2	Bilingual Proficiency in Malay and English	9
2.3	Orthographic Depth	10
2.3.1	The Orthographic Depth of the Malay Language	11
2.3.2	The Orthographic Depth of the English Language	12
2.4	Literacy Development: Reading, Spelling, and Handwriting	13
2.4.1	Reading	13
2.4.2	Spelling	13
2.4.3	Handwriting	14
2.5	The Relationship Between Reading, Spelling and Handwriting	15
2.5.1	Reading and Spelling	15
2.5.2	Reading and Handwriting	15
2.5.3	Handwriting and Spelling	17
2.6	Reading and Transcription Difficulties	18
2.6.1	Reading Difficulties	18
2.6.2	Transcription Difficulties	19

2.6.3	Co-occurring Difficulties in Reading and Transcription	20
2.7	Theoretical Framework of the Present Study	21
CHAPTER 3 METHODOLOGY		25
3.1	Background of the Larger Study	25
3.2	Measures	26
3.2.1	Name Writing	26
3.2.2	Letter Writing	26
3.2.3	Spelling	26
3.2.4	Word Reading Accuracy	27
3.3	Data Collection Procedures	27
3.3.1	Name Writing	28
3.3.2	Letter Writing	28
3.3.3	Spelling	28
3.3.4	Word Reading Accuracy	29
3.4	Operationalisation of Deficits in Reading, Spelling and Handwriting Skills	29
3.5	Data Analysis	30
3.5.1	Data Screening	30
3.5.2	Validity and Reliability of the Research Instruments	30
3.5.3	Descriptive Analysis	31
3.5.4	Inferential Analysis	31

CHAPTER 4	RESULTS	33
4.1	Data Screening	33
4.2	Validity and Reliability Analysis	33
4.2.1	Validity	33
4.2.2	Reliability	33
4.3	Descriptive Statistics	33
4.3.1	Handwriting Quality	34
4.3.2	Reading Performance	34
4.3.3	Spelling Performance	34
4.4	Categorisation of Students with Deficits in Reading, Spelling and Handwriting Skills	35
4.5	Inferential Statistics	35
4.5.1	Research Question 1: Is there any significant correlation between handwriting quality, reading in Malay, and spelling in Malay?	35
4.5.2	Research Question 2: Are poor readers in Malay also poor in handwriting?	37
4.5.3	Research Question 3: Are poor readers in Malay also poor spellers in Malay?	37
4.5.4	Research Question 4: Is there any significant correlation between handwriting quality, reading in English, and spelling in English?	38
4.5.5	Research Question 5: Are poor readers in English also poor in handwriting?	38
4.5.6	Research Question 6: Are poor readers in English also poor spellers in English?	39
4.5.7	Research Question 7: Are poor readers in Malay also poor readers in English?	40

4.5.8	Research Question 8: Are poor spellers in Malay also poor spellers in English?	40
CHAPTER 5 DISCUSSION AND CONCLUSION		42
5.1	Key Findings	42
5.2	Limitations and Future Directions	45
5.3	Implications for Policy and Practice	46
5.4	Conclusion	46
REFERENCES		48
APPENDICES		66

LIST OF TABLES

	Page
Table 4.1: Descriptive Statistics of the Total Dataset ($N = 866$)	34
Table 4.2: Poor and Good Outcomes Based on the 25 th Percentile Cut-off Criterion	35
Table 4.3: Correlations of Measures ($N = 866$)	36
Table 4.4: The Summary of the Statistical Significance between Malay Reading Performance and the Measures for Handwriting Quality and Malay Spelling Performance	36
Table 4.5: Crosstabulation of Handwriting Quality and Spelling Performance Among Poor Readers in Malay	37
Table 4.6: The Summary of the Statistical Significance between English Reading Performance and the Measures for Handwriting Quality and English Spelling Performance	38
Table 4.7: Crosstabulation of Handwriting Quality and Spelling Performance Among Poor Readers in English	39
Table 4.8: The Statistical Significance between Reading Performances in Malay and English Respectively	40
Table 4.9: The Statistical Significance between Spelling Performances in Malay and English Respectively	41

LIST OF FIGURES

	Page
Figure 1.1: Conceptual Framework of the Study	6
Figure 2.1: Simple View of Writing (Berninger et al., 2002)	23

LIST OF ABBREVIATIONS

<i>M</i>	Mean Score
<i>p</i>	Probability Value
PC	Phonological Coding
<i>r</i>	Correlation Coefficient
RD	Reading Difficulties
<i>SD</i>	Standard Deviation
WRA	Word Reading Accuracy

CHAPTER 1

INTRODUCTION

1.1 Study Background

Adequate proficiency in reading and writing establishes the crucial foundation for learning and excellence in school and at the workplace (McCloskey & Rapp, 2017; Puranik & Al Otaiba, 2012). Conventional literacy skills encompass decoding, oral reading fluency, reading comprehension, writing, and spelling skills (National Early Literacy Panel [NELP], 2008). Over the years, the importance of conventional literacy skills comprising phonological-decoding, sublexical-fluency, and vocabulary-memory has been demonstrated in many studies on preschool to elementary school children (Hulme & Snowling, 2015; Lee et al., 2020; National Reading Panel, 2000; NELP, 2008).

Apart from decoding (i.e., reading) and spelling skills that were identified as conventional skills by the NELP (2008), handwriting is also considered as one of the vital skills in early literacy development (James, 2017; Reutzel et al., 2019). As handwriting and letter perception belongs to the same network of activation in the literate brain, handwriting experience plays a crucial role in the formation of brain network that facilitates letter recognition (James, 2017; James & Berninger, 2019).

1.2 Problem Statement

Reading difficulties (RD) affect approximately 5% to 15% of students worldwide (American Psychiatric Association, 2013). In Malaysia, approximately 15% of children in mainstream classrooms have some form of learning disabilities, including RD (Wong et al., 2019). Recent empirical findings suggest that 24% to 35% of the first graders in Malaysian

government primary schools are at risk of RD (Lee et al., 2020). In comparison to students from other parts of the world, 45.8% of 15-year-old Malaysian students failed to meet the minimum proficiency level in reading (Organization for Economic Cooperation and Development [OECD], 2019). These estimated prevalence rates suggest that the early detection of RD by school professionals such as teachers is an important research agenda. The early detection and diagnosis of RD are crucial but the empirical evidence on valid and suitable indicators of RD in Malaysia is, hitherto, still in its infancy (Lee, 2008; Lee et al., 2020).

Students with RD typically struggle to link the letter to its respective sound during word decoding (reading) and the sound to the letter(s) during encoding (spelling), which affects word recognition (Hudson et al., 2007). Students with RD have been reported to also experience handwriting difficulties, suggesting a high chance of comorbidity (Döhla et al., 2016; Gargot et al., 2020). Handwriting difficulties are manifested in writing letters/words fluently and legibly (Ashraf & Najam, 2020; Berninger et al., 2008; Hebert et al., 2018; Sumner et al., 2014). Based on the simple view of writing by Berninger and colleagues (2002), transcription skills are comprised of both handwriting and spelling and some students with transcription difficulties were reported to experience RD while some students do not (Berninger, 2007; Di Brina et al., 2018; Prunty & Barnett; 2017). Among typically developing children, researchers have discovered a positive correlation between the mastery of handwriting skills and their spelling success (Alamargot et al., 2020; Lichtsteiner et al., 2018; Pritchard et al., 2020; Ritchey, 2008); conversely, children with poor handwriting obtained lower scores in both reading and spelling outcomes (McCarney et al., 2013).

Compared to RD, there are fewer empirical studies on specific written expression disabilities (i.e., handwriting and spelling difficulties) (Berninger et al., 2018; Grigorenko et al., 2020). However, there is a growing interest in the association between difficulties in reading, spelling, and handwriting (Alamargot et al., 2020; Arfé et al., 2020; Barnett et al., 2019; Prunty & Barnett, 2017). In recent years, a handful of Malaysian studies have increasingly emphasised the role of alphabetic/phonological awareness, grapheme-phoneme correspondence, and word recognition in Malay and English among young learners (Jamaludin et al., 2015; Lee, 2019; Lee & Wheldall, 2011; Wang & Lee, 2020). Hitherto, there is still a dearth of research on the relationship between reading, spelling, and handwriting in both Malay and English in the Malaysian context.

In a multi-ethnic and multicultural country like Malaysia, Malay (the Standard Malay, known as *Bahasa Melayu*) and English are the two main spoken and written languages besides Mandarin, Tamil, and other local dialects making Malaysia a multilingual nation (Lee et al., 2020). The aspiration for Malaysia, as documented in the Malaysian Education Blueprint, is for every child to be proficient in both Malay and English at the end of secondary school education (Ministry of Education Malaysia, 2013). Thus, both languages are taught in school. For instance, a student's first language may be Mandarin, but he/she would simultaneously receive formal instruction in Malay (the national language) and English in school. Given the emphasis on bilingual proficiency among Malaysian students, the use of both Malay and English is an important research focus. To date, the focus of most studies on literacy development and specific learning difficulties is on monolingual speakers (e.g., Alamargot et al., 2020; Arfé et al., 2020; Lee & Al Otaiba, 2017; Lonigan et al., 2013; Prunty & Barnett, 2017; Puranik & Al Otaiba, 2012; Shaywitz & Shaywitz, 2020; Snowling et al., 2019). However, there has been a surge of interest in the reading acquisition and

language development in both English and Malay among young multilingual learners (Jamaludin et al., 2015; Lim et al., 2015; Lee et al., 2019; Lee et al., 2020; Lee & Wheldall, 2011; Rickard Liow & L. C. Lee, 2004; Wang & Lee, 2020; Winskel, 2020).

In sum, at the heart of this issue is the need to consider appropriate identification of reading difficulties among young multilingual learners. The prevalence of students with reading difficulties, comorbidities between the difficulties in reading, spelling, and handwriting as well as the dearth of research in these three fundamental skills combined, within the multilingual context, have demonstrated the need of further investigation on the relationship of reading, spelling, and handwriting in literacy development.

1.3 Research Objectives

The objectives of this study are to:

- i. investigate whether there is any significant correlation between handwriting quality, reading in Malay, and spelling in Malay.
- ii. investigate whether poor readers in Malay are also poor in handwriting.
- iii. investigate whether poor readers in Malay are also poor spellers in Malay.
- iv. investigate whether there is any significant correlation between handwriting quality, reading in English, and spelling in English.
- v. investigate whether poor readers in English are also poor in handwriting.
- vi. investigate whether poor readers in English are also poor spellers in English.
- vii. investigate whether poor readers in Malay are also poor readers in English.
- viii. investigate whether poor spellers in Malay are also poor spellers in English.

1.4 Research Questions

The research questions of this study are:

- i. Is there any significant correlation between handwriting quality, reading in Malay, and spelling in Malay?
- ii. Are poor readers in Malay also poor in handwriting?
- iii. Are poor readers in Malay also poor spellers in Malay?
- iv. Is there any significant correlation between handwriting quality, English reading in English, and spelling in English?
- v. Are poor readers in English also poor in handwriting?
- vi. Are poor readers in English also poor spellers in English?
- vii. Are poor readers in Malay also poor readers in English?
- viii. Are poor spellers in Malay also poor spellers in English?

1.5 Significance of The Study

It is crucial to understand the relationship of handwriting, spelling and word reading accuracy among multilingual Primary 1 poor readers. As there is a growing interest in the field of reading, spelling, and handwriting, it is anticipated that this study can contribute to the extant literature. The already mounting evidence that alphabetic knowledge and phonological awareness are strong predictors of reading ability and RD (NELP, 2008; Shanahan & Lonigan, 2013), often deflect the necessity to use other indicators such as handwriting and spelling for detecting reading disability among young learners. Thus, this study may offer important practical implications for policymakers, practitioners, teachers,

and parents if more literacy components such as handwriting and spelling can be applied as indicators for the early identification of RD, especially among multilingual learners.

1.6 Conceptual Framework

The conceptual framework of this study is presented in Figure 1.1. Based on the performances in reading, handwriting, and spelling, A standard cut-off point of the 25th percentile and below was introduced to operationalise deficits in reading (See Section 1.7.5). The reading skill was assessed using the word reading accuracy (WRA) test; the handwriting quality was determined using name writing and letter writing tests); and spelling performance was determined using spelling test.

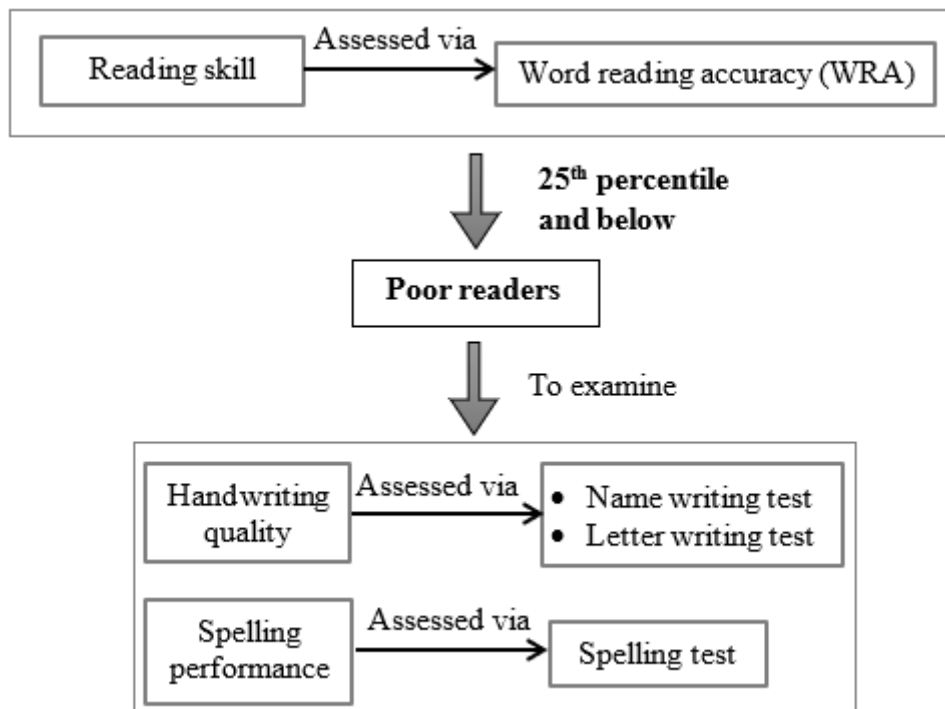


Figure 1.1: Conceptual Framework of the Study

1.7 Conceptual and Operational Definitions

1.7.1 Handwriting

Handwriting is one of the building blocks of writing (Limpo & Graham, 2020). It is a complex neuromotor skill that involves numerous incorporations of the cognitive and motor processes of the writer (Horowitz, 2018; Limpo & Graham, 2020; van der Meer & van der Weel, 2017).

In this study, handwriting was operationalised based on name writing and letter writing tests. The name writing test was used to evaluate the students' ability to write their names and was scored according to the letter formation, spacing, capitalisation, reversal, and spelling mistakes. Meanwhile, the letter writing test was used to evaluate the students' ability to write correct capital and small letters with appropriate letter formation.

1.7.2 Spelling

Spelling is a process of encoding phonemes into graphemes (Puranik et al., 2011; Sayeski et al., 2019). In this study, a spelling test (i.e., phonological coding) was used to evaluate the student's ability to spell the words that were verbalised by the test administrator. The spelling test was group-administered (Lee et al., 2020). The students were asked to spell 10 words each in Malay and English.

1.7.3 Word Reading Accuracy

Word reading accuracy was used in the current study to measure the reading skill (decoding) because word reading is aligned to the developmental time-point of Primary 1 children who were learning how to read words. Furthermore, the words used in the reading assessments have been taught to the beginning readers in the schools and the children are

familiar with word reading (Nation, 2019). Furthermore, the ability to decode is emphasised during early reading (Vaughn et al., 2019).

In this study, the word reading accuracy (WRA) test assessed the student's ability to read 10 single words each in Malay and English accurately. The WRA test was administered individually using the same words from the spelling test.

1.7.4 Multilingual

The conceptual definition of multilingual in this study referred to individuals who can speak their native language at home, their national language at school as well as acquire at least a foreign language (Duka & Aziz, 2019).

Multilingual was then operationalised by categorising students from different ethnic backgrounds, who have been receiving formal language instructions in Malay and English in schools and could speak in their first language (i.e., mother tongue).

1.7.5 Poor Readers

The conceptual definition of poor readers in this study was students who could not read Malay and English word accurately. In this study, a standard cut-off point of the 25th percentile and below was applied to operationalise poor readers. Numerous studies have applied a cut-off point of the 25th percentile and below to determine the presence of deficits across measures (Germano et al., 2017; Lee et al., 2020; Macaruso & Rodman, 2011; Snellings et al., 2009; Stanovich & Siegel, 1994).

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

In this chapter, the bilingual proficiency in Malay and English; the orthographic depths of Malay and English languages; the literacy development of reading, spelling, and handwriting; the relationship between reading, spelling and handwriting; reading, spelling and handwriting difficulties; and theoretical framework were elaborated.

2.2 Bilingual Proficiency in Malay and English

Growing up in a post-colonial and multi-ethnic nation like Malaysia, learning to speak more than one language is a norm for the people. Students may speak their native language at home, and national language at school as well as acquire at least a foreign language (Duka & Aziz, 2019). Learning to read in any language involves the process of matching grapheme on the page to the phonology of the spoken language (Winskel, 2020). Therefore, it is important to consider that different languages have different writing system and varies in their respective orthographic depths (Borleffs et al., 2019). Children who grow up in a multilingual context may face challenges as they learn languages and scripts that possess unrelated and distinctive characteristics, thus limiting the transferability of reading-related skills (Winskel, 2020).

In Malaysia, learning the English language involves multiple factors. On the Malaysian states of the island of Borneo, where the largest indigenous group is Iban, learning English is less straightforward than Iban and Malay languages as reported in a case study by Duka and Aziz (2019). Duka and Aziz (2019) reported that the learners' acquisition of English as a second language was influenced by multilingualism along with their home

learning support, perception towards the language and motivation in learning it. In another study by Lee and colleagues (2019), phoneme-grapheme connections in Malay word building among Malay-English bilingual Grade 2 Malaysian students (mean age = 8.01 - 8.07) were examined; high-performing students ($n = 32$) significantly utilised more syllabic and multi-letter chunks to build non-words. Contrarily, the low-performing students ($n = 24$) significantly applied more letter-by-letter strategy to build non-words, and the error patterns made indicate that their partial alphabetic knowledge was limited (Lee et al., 2019). It was concluded that the transparency of the writing system may facilitate less skilled readers to advance into the consolidated alphabetic phase during word building (L.W. Lee et al., 2019).

In a review by Winskel (2020) on phonological awareness and reading in unilingual and bilingual/multilingual contexts, specifically in the three main languages of Malaysia (i.e., Malay, Tamil and Chinese), learning to read in the second language would be easier if the orthography of the children's first language and their second language were similar. In sum, multilingualism can influence the language acquisition of the learner (Duka & Aziz, 2019). It is also vital to consider the orthographic depth of the language as it may impact the process of learning the respective language.

2.3 Orthographic Depth

The variability in the orthographic depth of a language influences the way learners understand the sound structures of the language (Borleffs et al., 2019). Orthographies are positioned on a continuum, depending on the grapheme-phoneme mapping consistency (Dixon et al., 2010). A shallow orthography means that there is a clear and predictable mapping between grapheme and phoneme (one-to-one grapheme-phoneme correspondence). For example, in Malay, the 'a' (/ʌ/) in *abang* (brother), *makan* (eat), and