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Phonological Awareness in Young Bilingual Dyslexics in Malaysia

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Table of Contents

Abstract

Research on dyslexia in Malaysia is still lacking. As a result, the general understanding of dyslexia is relatively low among teachers and parents who are not equipped with the necessary skills to provide assistance for dyslexic children. This study aims to add to existing research and the understanding of dyslexia in Malaysia. We conducted our study on two groups of children: dyslexic and unimpaired. We tested them on phonological awareness and reading tasks in Malay and English. Our results indicated that the dyslexic group performed poorer in accuracy and speed on all tasks compared to the unimpaired group. We also found a tentative effect of orthographic depth on reading performance because the unimpaired group performed far better than the dyslexic group in the English reading task despite their similar knowledge of English vocabulary. Furthermore, our results support previous findings indicating speed as a better predictor of dyslexia than accuracy in shallower orthographies.

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Chapter 1: Introduction

Dyslexia is a reading disability characterised by difficulties in spelling and decoding words which affects the ability to read fluently. The prevailing view of dyslexia from a cognitive perspective posits that a phonological awareness deficit in individuals is one of the main causes of dyslexia (Vellutino, 1979; Bradley & Bryant, 1983; Snowling et al., 1986). This phonological deficit hypothesis suggests that individuals with dyslexia have trouble mapping sounds to letters because they have difficulties with representing and/or recalling sounds and letters (Ramus, 2001).

The general awareness and understanding of dyslexia is still relatively low in Malaysia and this poses several challenges in providing support to individuals with dyslexia. For instance, Malaysia adopts a broad definition of learning disabilities which extends to include dyslexia, Down's syndrome, autistic spectrum disorders (ASD), attention deficit/hyperactivity disorders (ADHD), and mild intellectual disabilities (Lee & Low, 2014). This inclusive view of learning disabilities has resulted in the lack of targeted support for each group. Instead of specific intervention strategies for each group, general remedial programmes were introduced in schools to cater to all these groups.

In 2001, the Malaysian Ministry of Education (MoE) recognised dyslexia as a learning impairment that required a more focused intervention. A dyslexia screening checklist (*Instrumen Senarai Semak Disleksia*) was introduced so teachers and parents could identify children with dyslexia. The checklist consists of three elements: 1. Pupils' mastery of spelling, reading, and writing, 2. Perception of pupils' abilities/strengths, and 3. Observed behaviour. However, the checklist is mainly based on teacher and parent observations/perceptions without any objective reference because there is still no standardised test in Malaysia for identifying individuals with dyslexia. Furthermore, unlike most of the other learning disabilities, dyslexia is less observable in behaviour and Malaysian children with dyslexia are often mistaken as slow learners, lazy or lacking focus (Noor Amiera Alias & Dahlan, 2015; Sidhu & Manzura, 2013). So, some children with dyslexia are only identified later in Primary School; a few even slip through the cracks and remain unidentified throughout their school years (Ekhsan et al., 2012).

The current study investigates whether dyslexia in bilingual Malaysian children is more apparent in English than in Malay because of the orthographic depth of English. We first examine whether phonological awareness deficits affect the reading fluency (accuracy, effortlessness, and speed) of dyslexic children in Malay (shallow orthography) and in English (deep orthography). Then, we investigate whether the dyslexic group exhibits more severe dyslexia in English than in Malay. If orthographic depth affects the severity of dyslexia, both the dyslexic and unimpaired groups should perform better in Malay than in English. We limit the scope of our argument to Latin alphabet orthographies because Malay and English both adopt the Latin alphabet in print.

We base our argument on five primary points:

1. Reading acquisition involves the interaction between spoken and written language in terms of meaning, vocabulary and mapping sounds to letters. To read fluently, children need to remember how the word sounds in spoken language (phonology), how it looks in print (orthography), what it means (semantics and pragmatics), and how it is used in a sentence (grammar).
2. Phonological awareness is crucial for learning to read because it involves the ability to manipulate sounds in language and map sounds in spoken language to printed symbols. In alphabetic languages, the ability to map sounds to symbols is dependent on orthographic complexity. The less transparent the orthography, the harder it is to map letters to sound because there is more than one possible affiliation (e.g. a letter or a syllable has several possible pronunciations).
3. Bilingualism is a norm rather than the exception. So what happens when children learn to read in more than one language? Is it a similar process? Do the languages interfere? And what happens when the languages they are learning to read in use different orthographic depths?
4. One of the main causes of dyslexia is a fundamental deficit in phonological awareness which results in difficulties mapping letters to sound and manipulating sounds in language (e.g. rhyming, phoneme deletion). The problem dyslexic individuals face can be exacerbated by orthographic depth (i.e. the more complex the orthography, the harder it is for dyslexic individuals to make connections between letters and sounds).
5. We make our case by comparing Malay (shallow orthography) and English (very deep orthography. We predict that dyslexia would seem more severe in a deeper than shallower orthography because in a deeper orthography, there are more possible pronunciations for letters. Dyslexic individuals will face difficulties decoding words in an inconsistent orthography.

Chapter 2: Reading fluency

Reading fluency[1] involves the ability to quickly and automatically read words by sight and to retrieve their meanings without having to decode each letter of the word. The general consensus is that spoken and written language interact very closely. However, unlike spoken language, literacy is arguably not biologically programmed in humans and requires overt instruction to teach learners how to recognise symbols and what these symbols mean. Children must then remember these connections and retrieve this information when they encounter these symbols again. When these connections cannot be represented, stored, or retrieved properly, reading will be affected (Brady & Shankweller, 1991; Bradley & Bryant, 1978).

We can think of metalinguistic awareness as a general consciousness and understanding of language (its forms and functions); phonological awareness is a form of metalinguistic awareness (Campbell & Sais, 1995) that refers specifically to the awareness of sounds in a language and the ability to manipulate those sounds. The ability to make the association between symbols and sounds (grapheme and phoneme association) requires the development of metalinguistic awareness. Metalinguistic awareness is generally understood to be the ability to think about and reflect on the functions and characteristics of language (Doherty, 2008; Tunmer et al., 1984). Children who have metalinguistic awareness are conscious that language is representational (e.g. representing ideas, objects etc.) and that the sounds and structures of a language can be manipulated (phonological awareness). In reading acquisition, metalinguistic awareness extends to realising that spoken language can be represented in print and understanding how it is represented (Nagy & Anderson, 1995). For instance, children need to understand that letters represent sounds in the spoken language. These letters or sounds can then be combined to form syllables and words.

Reading seems to be a paradox. Children who are learning to read need to understand what they are reading, but comprehension requires reading practice. The lexical quality hypothesis (Perfetti & Hart, 2002) suggests that building high lexical quality representations requires reading practice and reading practice strengthens lexical representations. The more encounters children have with a word in different contexts and uses, the better they understand the word. Perfetti and Hart (2002) posit that the ability to read well and to fully comprehend

[1] See Kuhn et al. (2010) and Logan (1997) for a more detailed discussion about reading fluency.

what is read rests on building high quality mental representation of words. Building high quality lexical representations entails remembering how a word sounds in spoken language (phonology), how it looks in print (orthography), what it means (semantics and pragmatics), and how it is used in a sentence (grammar). If one of these four[2] constituents is missing or incomplete, reading comprehension is compromised. For example, if a reader understands the word "school" and knows how it is pronounced but does not know how it is spelt, she will not be able to identify the word when she encounters it in print. If the reader knows how a word is spelt and how it sounds but does not understand what "school" is, her reading comprehension is compromised. Finally, if a reader understands the meaning of "school" and how it's spelt but does not know the correct pronunciation of "school" (e.g. thinks it is pronounced /shul/), the representation of the word "school" is also compromised. A *skilled* reader retrieves orthographic, phonological, semantic, and syntactic information very quickly and with minimal effort because the words they are reading are very well represented in their mental lexicon.

The reading acquisition[3] process is extremely complex and there is still no satisfactory idea as to how children learn to read. However, it seems to occur in three main stages: *acquisition*, *automaticity*, and *transfer* (Seidel et al., 2007). In the acquisition stage when children start learning to read, the visual processing of words begins with phonetic processing (i.e. how a spoken word or syllable looks in print). To do this, children need to have letter knowledge; they must be able to recognise letters before they can learn to combine letters into larger units. Previous studies indicate that letter-name knowledge is the best predictor of early reading acquisition (e.g. Wagner et al., 1994; Chall, 1967). Children must also remember the association between printed letters and their phonetic representations, so they can recognise it again when they encounter it in future. During this stage, children are becoming familiar with the alphabet, story reading, and building letter sound relationships (Chall, 1996).

They also develop phonological awareness. Phonological awareness is crucial in the early stages of reading because it enables them to make connections between sounds and letters. Furthermore, children who have phonological awareness can segment and blend phonemes, as well as manipulate individual phonemes in words to produce new words (Chard & Dickson, 1999). For example, they would know that switching the phoneme /b/ in 'bat' to /f/ will produce a different word, 'fat'. Skills such as rhyming and phoneme deletion are indicative

[2] Perfetti and Hart (2002) name only three constituents because they consider semantics and syntax as one constituent.

[3] Many reading acquisition theories and frameworks have been proposed (e.g. Gough & Hillinger, 1980; Frith, 1985; Seymour, 1997). See Stuart & Coltheart (1988) and Aro (2005) for a more detailed discussion.

of phonological awareness (Goswami & East, 2000). We discuss phonological awareness in greater detail in the next section.

The second stage, automaticity, involves the automatization of the lower processes learnt in the acquisition stage (Logan, 1997). The reader can combine those skills to decode whole words immediately. Word recognition is automatized at relatively early levels of reading acquisition (Seidel et al., 2007). This makes reading quick, effortless, and autonomous (fluent readers cannot choose not to recognise words) (Logan, 1997; Kuhn et al., 2010; Megherbi et al., 2018). When reading is automatized, less effort is required for decoding which allows the reader to pay more attention to text comprehension and think critically about what they are reading (Seidel et al., 2007).

The final stage involves transferring the ability to read quickly and efficiently across a variety of uses such as interpreting and understanding abstract concepts (Seidel et al., 2007). The reader can associate what they are reading with their past experiences, beliefs, and ideas. They also learn more complex skills such as retrieving previous information, integrating old information with new, and building their own conclusions and representations of what they have read. They are then able to discuss the information they have read, present alternative views, and substantiate their stand. Transfer also involves developing strategies to read texts across disciplines such as history, science, and social studies. The reader is able to comprehend texts on inherently different subjects and integrate it with their previous knowledge.

Chapter 3: Factors Influencing Reading Acquisition

PHONOLOGICAL AWARENESS

Early reading development is concerned mainly with the first two stages of literacy development – acquisition and automaticity. As mentioned before, phonological awareness is crucial in the early stages of learning to read as it involves sensitivity to sounds in language and the ability to manipulate them. However, the relationship between phonological awareness and reading may be bidirectional (e.g. Stanovich, 1986; Perfetti et al., 1987; Stuart & Coltheart, 1988; Tunmer & Rohl, 1991; Bentin & Leshem, 1993; Lerner & Lonigan, 2016). This view proposes that certain phonological skills facilitate reading skills and those reading skills in turn enable the subsequent development of other phonological skills. Bentin and Leshem (1993), for example, found that learning to read accounted for significant improvement in phonemic segmentation skill in the first year of instruction; phonemic skills in kindergarten helped reading acquisition in children with potential for reading disorders. Burgess and Lonigan (1998) identified phonological sensitivity as a predictor of development in letter knowledge, and vice-versa, letter knowledge predicted development in phonological sensitivity when age and oral language abilities were controlled. This suggests that children require phonological awareness for acquiring reading skills and their reading skills can further enhance their phonological skills.

Children who have phonological awareness are better and quicker at acquiring reading skills. For example, many studies have found phonological awareness to be a primary predictor of reading abilities (e.g. Goswami & Bryant, 1990; Kirby, Parrila and Pfeiffer, 2003; McBride-Chang & Kail, 2002; Schatschneider, et al., 2004; Rothou et al., 2013). In a longitudinal study spanning six years, Kirby, Parrila and Pfeiffer (2003) found that kindergarten children with phonological awareness deficits were more likely to have reading difficulties by Grade 5 (age 10-11). Although these children showed some improvement over time, they still failed to achieve the same level of reading achievement as their normally developing peers by Grade 5. In a separate study, McBride-Chang and Kail (2002) also found phonological awareness to be the strongest predictor of reading across languages. Their study compared kindergarten children in Hong Kong and kindergarten and first graders in the United States on Chinese character and English word recognition, phonological awareness, speeded naming, visual-spatial skill, and processing speed. For both groups, the phonological awareness tasks (syllable deletion, syllable naming, and letter sound knowledge) were strongly related to

Chinese character and English word recognition. This is because phonological awareness helps beginner readers (who haven't reached automaticity) to map letters to sounds which in turn helps them decode words, thus making phonological awareness a crucial part of early reading abilities.

The importance of phonological awareness for reading abilities is also apparent based on effects of phonological training on ensuing reading abilities (see Phillips et al. (2008) for a more detailed discussion). When children are trained to use phonological skills at an early age, they quickly learn to identify letter sounds, onsets, rimes, syllables and other features of words that can help them decode words. Furthermore, phonological awareness does not necessarily develop innately (Segers & Verhoeven, 2005) so instruction is necessary. In a meta-analysis on the effects of systematic phonics instruction, Ehri et al. (2001) found that systematic phonics instruction improved children's early reading abilities (word decoding, spelling) more than other forms of instruction (e.g. regular instruction, whole language, whole word etc.). Phonics instruction involves teaching the alphabet, alphabet sounds, and how to use this knowledge to decode words. The skills learnt from phonics instruction not only helped children across low and middle SES, it also benefitted younger and older children with reading difficulties. They also found larger effects when phonological skills were taught early than after the first grade. Leafstedt et al. (2004) found similar effects of phonological awareness instruction on reading abilities. In their experiment, 18 kindergarten children were given 300 minutes of intensive phonological awareness training (e.g. phoneme identification, rime, blending, segmenting etc.). The results showed that high- and middle-performing children who received explicit instruction in phonological skills improved significantly in word and pseudoword reading compared to high- and middle-performing children who received regular kindergarten instruction. These studies replicate previous findings (e.g. Bradley & Bryant, 1983; Lundberg et al., 1988; Ball & Blachman, 1991) indicating the positive effects instruction in phonological skills have on reading development. Therefore, children who are able to master phonological awareness at an early age have an advantage in developing reading abilities.

ORTHOGRAPHIC DEPTH

Other factors such as the features of the language and orthography also significantly influence reading acquisition and competency. Orthography depth (other terms include: transparency, complexity) refers to the complexity of a language's writing system. In a shallower orthography such as Italian or Malay, sounds can be mapped more consistently and

reliably to letters/symbols. Conversely, in deeper orthographies such as English, French, and Danish, sound-to-symbol mapping is unreliable and inconsistent, and letters can have multiple pronunciations. However, English is often regarded as an outlier because it is even less transparent than deep orthographies such as Danish and French (Ziegler et al., 2010). For example, the letter 'a' in English is pronounced differently in the words 'mat', 'fall', 'march', and 'face' and the letter clusters 'ea' have different pronunciations in the words 'bread', 'break', and 'bead'. English also contains stresses that change the way a word is pronounced and its meaning but not the way it is spelt. The word 'present', for example, has two different pronunciations, /ˈprɛz(ə)nt)/ and /prɪˈ zɛnt/, which not only denote different meanings, but also different words classes (i.e. adjective, noun and verb) depending on the context. When letters or letter clusters have more than one pronunciation, children cannot rely solely on symbol-to-sound mapping. Instead, they must memorise how words, even familiar ones, are spelt (Antzaka et al., 2017). Consequently, both normal and impaired readers face more difficulties with decoding words when learning to read in deep orthographies.

Seymour et al. (2003) propose syllabic complexity as an additional dimension of classifying orthographic depth. They suggest that in shallower orthographies, especially among the Romance languages like Italian and Spanish, syllables are often of the open CV form; there are fewer initial or final consonant clusters (e.g. CCV, VCC). This additional dimension takes into account further additional irregularities such as complex syllable structures, morphological features etc. Based on this additional criterion, they hypothesise that German which is considered a shallow orthography would have a complex syllabic structure whereas French, which is considered a deeper orthography, would have a simpler syllabic structure. For example, German orthography is considered shallow because the letter-to-sound symbol is quite consistent (e.g. *einst* is pronounced [aɪ̯nst]), but it has more complex syllable structures (e.g. VVCCC in *einst*). French, on the other hand, is less consistent in terms of sound to symbol mapping (e.g. *chante* is pronounced [ʃɑ̃ːt]) but it has simpler syllable structures (e.g. CVC in *chante*).

Although the automaticity stage is reached at a relatively young age, automaticity in word decoding can take longer to achieve in deeper orthographies (e.g. Ziegler et al., 2010; Seymour, Aro, and Erskine, 2003). Studies have found that children learning to read in a deeper orthography take longer to achieve similar levels of reading fluency compared to children learning to read in shallower orthographies. Seymour, Aro, and Erskine (2003) compared the reading accuracy and fluency of children at the end of Grade 1 across 13 European orthographies. The children from the participating countries were tested on letter

knowledge, word recognition, and non-word decoding. The study found that the accuracy in word recognition and decoding skills was lower for English, Danish, French, and Portuguese-speaking children (deeper orthographies) than children from the nine other participating countries such as Norway, Germany, and Italy. Seymour et al. (2003) also found that children took more than twice as long to achieve the same level of reading development in English compared to shallower orthographies. The performance on reading accuracy at the end of Grade 1 is usually >90% in most languages but >70% in languages with deeper orthographies. Danish and English are both regarded as deep orthographies, but English seems to be the most complex. Although Danish children required an extra year to achieve >90% accuracy, the English children still did not achieve this level even after two years. Seymour et al. concluded that alphabetic processing skills are sufficient for reading acquisition in shallow orthographies because speech sounds always correspond to the affiliated letters. However, word decoding in deep orthographies like English require the use of alphabetic and logographic skills (identifying whole words from memory) especially for irregular sounding words like ‘yacht’, ‘bough’, and ‘bought’. Other cross-linguistic studies on orthography depth that looked at German (Landerl, Wimmer & Frith, 1997; Goswami, Ziegler & Richardson, 2005), Finnish, Hungarian, Dutch, Portuguese, and French (Ziegler et al., 2010) had similar findings. These studies provide convincing evidence that orthographic depth influences children’s reading acquisition.

Chapter 4: Dyslexia

Learning to read can be difficult for normally developing readers. However, dyslexic readers face an even greater disadvantage because of their phonological awareness deficits. Dyslexia is a reading disability of neurobiological origin that occurs in individuals regardless of intelligence. It is characterised by difficulties in identifying words correctly and fluently, and weak spelling and decoding skills (Lyon et al., 2003). As a result of these difficulties, dyslexic individuals often find reading taxing, causing comprehension, vocabulary development, and overall reading experience to be compromised. The most popular cognitive view of dyslexia hypothesizes that it is caused by phonological awareness deficits, resulting in insensitivity to phonemes, difficulties recalling sounds and letters, and difficulty mapping sounds to letters (Stanovich, 1986; Snowling, 2001; Ramus, 2003). Children first learn to read by learning the association between printed symbols, sound and meaning. They build lexical representations of words based on this information which is stored in their mental lexicon and recall the information when the words are encountered again. If the coding and representations of spoken words are weak, these early readers will have difficulties making connections between the sounds of their language and the symbols that represent them. Indeed, a characteristic of dyslexic readers is their struggle to get pass the acquisition stage of reading. More attention and effort are spent recalling symbol-to-sound connections than on comprehension, making reading demanding and unenjoyable.

Substantial evidence points to a deficit in phonological awareness as a main cause of dyslexia (Bradley & Bryant, 1983; Liberman & Shankweiler, 1991; Fletcher et al., 1994; Snowling, 2001; Lyon et al., 2003). These studies mainly assessed the participants' abilities to identify, segment, and use phonemes in spoken words (Bernstein, 2009). Dyslexic readers were consistently found to have significantly weaker phonological awareness skills compared to non-dyslexics of the same age and even to younger non-dyslexics with similar reading levels (e.g. Bradley & Bryant, 1978; Bruck & Treiman, 1990). Swan and Goswami (1997) found that dyslexic children performed worse in phoneme identification and counting than their normally developing counterparts. Other studies found that dyslexic children tend to perform more poorly in the identification of consonants (Breier et al., 2002; Serniclaes et al., 2001) and that they tend to mix up some vowels with similar sounding items (Bertucci et al., 2003). As a result of these difficulties, dyslexic individuals have difficulty mastering early reading skills let alone achieving automaticity in reading. Moreover, the reading difficulties that dyslexics face persist into adulthood. Fawcett and Nicolson (1995) found that the overall performance of 17-year-old

dyslexics on sound categorization and phoneme deletion tasks was lower than 8-year-old controls. Pennington and Lefly (2001) found that phonological deficits experienced by dyslexic readers seem to continue despite instruction. They also found that the group differences between similarly aged dyslexic readers and the control group remained equally large over the 3 years they were tested. The dyslexic readers had difficulty with phoneme deletion, word segmenting, and identifying and manipulating phonemes. Gallagher et al. (1996) reported that phonological difficulties in high-functioning dyslexics persisted among individuals who seemed to have improved their reading skills to within one standard deviation of the norm population. These studies indicate that despite having achieved high-levels of word recognition, the dyslexic readers continued to have problems in subsyllabic phonology. It is also an indication that context is important for dyslexic readers to help them identify words correctly.

The effects of orthographic depth are visible in normally developing readers but are even more pronounced for dyslexic individuals. Paulesu et al. (2001) found an interesting effect of orthography depth on dyslexic individuals in their study which compared Italian, English, and French dyslexics. Although the Italian dyslexics performed poorer than the Italian control group, they performed better than the French and English dyslexics on reading tasks. While recruiting Italian dyslexics for the study, they also found that dyslexia was not diagnosed as often in Italy as it was in France or England. Paulesu et al. conclude that whereas phonological processing deficit is universal in dyslexic individuals, the differences among dyslexics from different countries are rooted in the type of orthography, which in this case, is the depth of the orthographies (Italian is shallow, English is deep and French falls somewhere in the middle). This suggests that an individual who is diagnosed with dyslexia in a deep orthography may not be in a shallow orthography or perhaps the manifestation of dyslexia in a shallow orthography is less severe than in a deep orthography. When learning to read in a deep orthography, a dyslexic individual is unable to rely on direct symbol-to-sound mapping to decode words because the sound-to-letter mapping is inconsistent. This poses a problem for dyslexic readers who may not have had enough reading practice; they may not have encountered irregular words often enough to remember them. Consequently, they may not have these irregular words in their mental lexicon and cannot read or decode them correctly.

Chapter 5: Languages in the study

The current study focuses on bilingual children in Malaysia who are exposed to Malay and English. Malaysia is a multicultural country with a variety of races and languages. The Malays and indigenous groups make up the majority Bumiputera ethnic group (67.4%), followed by the Chinese (24.6%), Indians (7.3%), and other groups (0.7%) (Department of Statistics Malaysia, 2010). The national language of Malaysia is Malay (Bahasa Melayu). It is an Austronesian language spoken in Malaysia, Indonesia, Singapore, and Brunei. In Malaysia, Malay is the main language used at all levels of government and in the legal system. In school it is the main medium of instruction from Standard One (primary level) up to Form Six (secondary level). A number of subjects at university level are also taught in Malay. Malay is a very important language in Malaysia because it is, primarily, the first language of the largest ethnic group, the Malays, and because it has become the lingua franca of Malaysians. For many non-Malay Malaysians, Malay is a second language where other languages such as Mandarin, Tamil or Dusun etc. are the first language.

English is the second official language of Malaysia. This is a result of a long British colonial history that ended in 1957. Until the 1970s, English was still widely used in government departments and as the medium of instruction in schools. Presently, it is a compulsory subject studied by all students at all levels of primary and secondary education. In urban areas, English[4] is widely used in everyday conversations. However, the position of English has always been precarious because like in many multilingual countries, English must compete with the local languages in Malaysia. However, English plays an important role in the economics and politics of Malaysia, so a balance is required to meet both national and international needs (Azirah Hashim, 2007). Use of English has also declined in Malaysia because of efforts to elevate the status of Malay as a national language and identity. This decline garnered the attention of the academic, business, and diplomatic communities who have been instrumental in compelling the Ministry of Education to remedy the problem. As a result, there have been renewed efforts since the 1990s by the Ministry of Education to "reestablish English" (Vethamani, 1996) in Malaysia. A strong presence of English in Malaysia is still evident especially in the media and the availability of English literature, suggesting that the decline is

[4] Spoken English in Malaysia typically refers to the Malaysian English variation which contains borrowed words and grammatical forms from Malay, Chinese, Tamil, and other languages. Code switching is also very common in Malaysia. See Thirusanku & Md. Yunus, 2012; and Tan, 2013 for a more detailed explanation and review of Malaysian English)

perhaps not in usage but in the overall standard (for a review on English in Malaysia, see Thirusanku & Yunus, 2012).

English and Malay share the same alphabet but with some differences. It is also important to note that there are two main pronunciation systems in Malaysian Malay: Standard Baku and Non-standard/colloquial Malay (Yap et al., 2009). The Standard Baku pronunciation is the standard variety of spoken Malay in the country. It is also the variety taught and used as the medium of instruction in schools. However, there are non-standard varieties of Malay which are dialectal and differ phonologically from Standard Baku. For example, the word 'open' in Malay, 'buka', is pronounced /bu.ka/ in Standard Baku, but pronounced /bu.kə/ in most non-standard dialects. The present description of Malay is based on the Standard Baku system. The Malay alphabet, Rumi, uses the Latin alphabet with a slight difference; it has five simple vowels and 20 consonants (instead of 21; 'x' is not used in Rumi). The vowels have a consistent symbol-to-sound mapping, except for 'e' which has two possible pronunciations: 'a'- /a/, 'e'- /ə/ or /e/, 'i'- /i/, 'o'- /o/, and 'u'- /u/. The consonant 'x' is not found in Rumi and 'q' and 'v' can only be found in borrowed words such as "Quran" (Koran) and "visi" (vision). There are five diagraphs in Rumi (<gh>, <kh>, <ny>, <ng>, <sy>) and three diphthongs (<ai>, <au>, <ua>) (Awang, 2004; Lee, 2008). Malay is a shallow orthography, so phonemes and letters correspond more reliably in Malay than in English. For example, the English word 'brought' has only four phonemes /brɔːt/ (/b/ + /r/ + /ɔː/ + /t/) although it is made up of seven letters. On the other hand, the Malay word for happy, 'gembira', has seven phonemes (/g/ + /ə/ + /m/ + /b/ + /i/ + /r/ + /a/) to its seven letters. The direct symbol-to-sound mapping in Malay makes Rumi much easier to read even without lexical knowledge (Awang, 2004; Lee, 2008). This makes word pronunciation in Malay quite regular. Malay contains stresses, but they are often on the last or second last syllable of a word (Goedemans & Zanten, 2007; Gomez & Reason, 2002). So, for example, the word "friend" in Malay, 'kawan', is pronounced /ka.wan/ with no other pronunciation variations or syllabic stresses.

The syllable structure of Malay is also less complex than English. Although Malay is based on smaller phonemic units, Malay words have distinct syllable structures because syllables are prominent units (Isahak, 1990). Malay has only four basic syllable structures – V, VC, CV, and CVC (Hamdan, 1988). However, foreign loanwords have introduced seven more syllable structures which are CCV (demokrasi [democracy]), CCVCC (kompleks [complex]), CVCC (teks [text]), CCVC (kluster [cluster]), CCCVC (skrip [script]), CCCV (strategi [strategy]), and VCC (abstrak [abstract]) (Gomez & Reason, 2002). Malay, however, does not have many monosyllable words and the ones that occur are mainly prepositions (Nik Safiah et al., 2004).

For instance, monosyllabic words in English such as ‘ball’, ‘cat’, and ‘dog’ are often used when teaching early readers. The Malay equivalent of these words are also used to teach early readers in Malay but they are often disyllabic (e.g. ball = bo.la, cat = ku.cing, dog = an.jing). Unlike English, Malay words, even high frequency ones, are made up of many syllables. ‘Perpustakaan’, which is the Malay word for ‘library’, consists of five syllables (CVC+CVC+CV+CV+VC). Syllable breaks may pose a problem for beginner readers especially for words with adjacent vowels. When ‘a’ and ‘i’ or ‘a’ and ‘u’ are adjacent, the syllable break comes in between (e.g. ‘buat’ = bu.at [CV+VC] & ‘main’ = ma.in [CV+VC]).

Children in Malaysian primary schools are often taught to spell out segmented syllables, sound out those syllables, and then combine the syllable sounds to form words (Lee & Wheldall, 2011). For example, to read aloud the word “bola” (meaning *ball*), the child first spells the first syllable b+o and sounds out the syllable “bo”. Then he spells the second syllable l+a, and sounds it out “la”. Finally, the combines the two syllables bo+la are combined to form the word “bola”. This method teaches children to learn letter names, syllable segmentation, and syllable blending. The focus is, therefore, on learning syllables as basic sound units instead of phonemes and letter sounds (Lee, 2008; Lee & Wheldall, 2011). Lee (2008) suggests that grapheme-phoneme knowledge is often discounted in Malay because syllables are more easily accessible and salient compared to phonemes. Phonemes in Malay are less obvious and, therefore, harder to identify.

The research on the grain-size phonological processing of Malay is mixed. Liow and Lee (2004) found that children learning to read in Malay successfully rely on their knowledge of larger grain syllables and morphemes to read and spell because they are not explicitly taught decoding at the grapheme-phoneme level. Winskel and Widjaja (2007)[5], however, found that phonemes are salient phonological units in early reading acquisition. But interestingly, they found that phoneme knowledge is a predictor for non-word reading but not for familiar words or stem words. They also found that syllables are important for reading multisyllabic affixed words. Lee and Wheldall (2011) conducted a study comparing low-progress readers and good readers on word recognition skills. The good readers demonstrated good letter-to-sound knowledge although they had no phonemic instruction and they were able to segment syllables in words very well. The low-progress readers, however, had significantly more non-word errors than real word errors and were unable to recognise syllable structures so they performed

[5] This study was conducted on Indonesian, but the findings are applicable to Malay too because Indonesian and Malay are orthographically, phonologically, and syntactically similar. They are often considered varieties of the same language.

poorly on syllable segmentation. Lee and Wheldall (2011) conclude that the good readers probably attained phonemic knowledge implicitly by making connections between letters and sounds. The low-progress readers, on the other hand, rely on grapheme-phoneme decoding to read words but the instruction methods in school do not facilitate this strategy. It is possible that grapheme-phoneme knowledge is more important at very early stages of Malay reading acquisition when children are just learning to recognise letters. But once they have acquired letter knowledge and letter blending skills, syllables become more prominent units.

Chapter 6: Current study

The current study concerns the Malay and English reading performance of bilingual dyslexic children in Malaysia compared to an unimpaired group of non-dyslexic children. Malaysian children with phonological awareness deficits have difficulty decoding words in Malay and English. However, we predict that their difficulties will be more evident in English because of the difference in orthography depths of Malay and English. The dyslexic group's performance is expected to be poorer than the unimpaired group's in both languages. However, their performance in Malay should be better than in English because Malay is shallower orthography than English. Both groups are compared on their reading fluency which is a combination of accuracy and speed. Studies (e.g. Wimmer, 1993; Jiménez González & Hernández-Valle, 2000; Serrano & Defior, 2008) have found speed to be a more reliable predictor of reading impairments in shallower orthographies whereas both speed and accuracy can predict reading impairments in deeper orthographies. In shallower orthographies, there are fewer irregular pronunciations and readers are able to rely on symbol-to-sound mapping to read accurately. However, the dyslexic group would still take longer to decode words compared to non-dyslexic readers. In deeper orthographies, dyslexic readers have been found to perform more poorly in both accuracy and speed. We also expect an interaction between the syllable reading and Malay word reading tasks; both groups' performance in the Malay word reading task is dependent on the syllable reading task. This prediction is based on previous research by Liow and Lee (2004) who found syllables to be a predictor of reading and spelling.

Methods

Participants

With the approval of the Malaysian Ministry of Education (MOE), data was collected from two groups of participants – an unimpaired group and a dyslexic group. Parents of participants had to sign a parental consent form before their children could be included in the study. To control for language, both groups consisted of Malaysian students of Malay ethnicity who were bilingual in Malay and English. The unimpaired group consisted of 27 Standard Two (mean age 8;4) primary school children (14 girls and 13 boys) in Kuala Lumpur (age range=7;10 – 8;8). Six students were selected from each of five classes that were grouped by overall academic achievement in their first year of school for a total of 30 participants; see

below for more information about selection criteria. Of the 30 participants selected, three participants had to be excluded due to insufficient data and lack of parental consent.

The experimental group consisted of 21 children (7 girls and 14 boys) from the Ampang branch of the Dyslexia Association of Malaysia (Persatuan Dyslexia Malaysia – PDM). Children at the association were enrolled here by their parents; they were temporarily taken out of their schools and put in programmes ranging from three months to a year depending on their progress. The lessons focused on language and mathematics only, to avoid overtaxing the children. They were given an initial language and literacy assessment upon entering the association and were placed in the beginner, intermediate or advanced group based on their scores. The age range for the experimental group was also bigger, (age range= 4;9 – 11;1 ; mean=7;3). At the time of data collection, no standardised measures had been established to test for dyslexia in Malaysia. PDM used instruments designed by the staff to diagnose children with dyslexia but these instruments were not standardised. For this group, teacher feedback was also used to select students who exhibited only reading impairments and no other comorbidities such as autism and attention deficits[6]. The selected children were at the beginning of the intervention programme, so their reading abilities are presumably an authentic reflection of the impairment.

The children come from a variety of backgrounds, so it was very difficult to control for socio-economic status (SES). Based on information from PDM, 12 of the participants were identified as coming from high income families while the rest come from families with average incomes. The unimpaired group also had 12 participants from high income families to match the participants in the dyslexic group. The remaining 15 were from average income families. Information about SES for the unimpaired group were obtained from school records with the Headmaster's permission. Although we did not directly investigate SES in our study, controlling for SES was part of our efforts to reduce the possible influence of this confounding variable.

[6] Specific language impairment (SLI) is often comorbid with dyslexia (See Bishop & Snowling (2004), Catts et al. (2005) and Ramus et al. (2013) for a more detailed discussion on this topic). However, the Dyslexia Association of Malaysia does not differentiate between dyslexia and SLI. As a result, there is a possibility that some participants in the dyslexic group had both dyslexia and SLI.

Instruments

Peabody Picture Vocabulary Test – IV (PPVT-IV)

The Peabody Picture Vocabulary Test – IV (PPVT-IV; Dunn & Dunn, 2007) is a standardised vocabulary test which can be used to assess the lexicons of children and adults. The test consists of 19 item-sets, each containing 12 items of increasing difficulty. It is separated into two forms, Form A and Form B, which have unique items but are similar in difficulty level. Selection of the forms is dependent on the researcher. For experimental studies, either form is adequate, but the researcher may choose to use both forms when monitoring language progression or conducting longitudinal studies. The manual also provides tables for interpreting the scores. These tables include standardised scores, norms, and percentile information based on a normative sample in the United States. Using this information, experimenters are able to compare the participants' vocabulary size to norms of the relevant age group in the U.S. For each test item, the experimenter gives the participants a prompt and from a choice of four pictures, they point to the matching one. If a participant makes three or more errors in an item-set, that set is considered the ceiling set and the test is stopped.

For this study, the PPVT-IV was administered to assess the participants' English vocabulary knowledge and as a proxy for their second language skills; Form B was used. The test was carried out and scored according to the instructions in the handbook. However, the participants' scores were not comparable to the standardised scores in the manual because the PPVT-IV standardised scores are based on native speaker norms whereas the participants were speakers of English as a second language. For this reason, only their raw scores were used in the analysis.

Phonological awareness tasks

Early reading abilities in children can be predicted by their phonological awareness. Dyslexic children have been found to lack this sensitivity to phonology thus impeding their ability to decode words effortlessly which in turn affects their reading fluency. In this study, both the unimpaired and dyslexic groups were tested on phonological awareness tasks and their scores were compared. The tasks were also used to predict their performance on the reading tasks. The phonological awareness measures consisted of letter recognition and phoneme deletion in the initial, middle, and final positions.

Letter Recognition

20 letters from the alphabet were shown to participants on the computer screen and they had to identify each letter aloud. We collected accuracy and response time data. There was no time limit for completing this task but the task was stopped if a participant made three consecutive errors.

Phoneme Deletion

This task was made up of three subtasks: phoneme deletion in the initial, middle and final positions. For each task, participants were asked to delete phonemes from 10 words. Examples of the phoneme deletion tasks at word-initial, mid-word, and word-final position are as follows: *kawan* = *awan; kain* = *kan*; and *kamus* = *kamu*. The phoneme deletion tasks were carried out verbally, but for each word the experimenter made sure that the participants understood what the word meant to prevent errors caused by misinterpretation or mishearing of the word. Participants were also given one or two practice words to demonstrate what was expected of them. When they were unable to perform the practice task, the experimenter helped by encouraging the participant to decode the letter, syllable or word or make guesses based on the verbal cues or prompts given. During testing, however, no verbal cues or prompts were given. The participants were scored on accuracy and time. These tasks were conducted in the same sequence for both groups of participants. For each phonological awareness task, the participant was stopped after three consecutive errors were made. The full list of phoneme deletion stimuli is included in the Appendix.

Reading tasks

The reading measures included Malay words and Malay sentences, an English text, syllable reading, and pseudowords. Nearly all words in the Malay reading task, were taken from the Standard One Malay textbooks; the few exceptions were from Standard Three textbooks, included to control for ceiling effects. For each task, if the participant had difficulties, the experimenter used prompting and verbal cues to help them. Items that the participants read accurately after prompting were scored correct. The reading tasks were carried out in random order to control for priming effects. The participants were scored on accuracy and time taken to complete each item (Malay words and pseudowords) and each task. For all tasks, participants were allowed to stop the test if they felt too tired to continue. The experimenter also halted the task if the participants made more than three consecutive errors on each task.

Syllable Reading

This task was essentially a monosyllabic pseudoword reading task. 20 two- and three-letter syllables (12 two-letter syllables and 8 three-letter syllables) were shown to the participants on the computer screen and they had to identify them. Similarly, the participants were scored on accuracy and time taken to complete the whole task. Examples of the task include *ba*, *lo*, *ke*, etc. for the two-letter syllables and *lap*, *mat*, *dan* etc. for the three-letter syllables.

Pseudowords

The pseudoword list consisted of 25 2- to 4- syllable pseudowords that were constructed by the experimenter based on Malay syllable structures (e.g. CVC, CVCV, and CVCC). Some of the words were adapted from real Malay words and others were novel words that adhered to the syllable structure of Malay words. Some examples of the pseudowords include *pernak*, *menilur*, and *kidahila*. The full list can be found in the Appendix.

Malay Words

The 40 Malay words used in this task can be found in the Standard One and Standard Three textbooks. They range from 2- to 5-syllable words. Some examples of the words used are *bola*, *rumah*, *pelajar*, *perkataan* and *perpustakaan*. The full list of words can be found in the Appendix.

English Text

The English text was a short story of 156 words. Sentence types in the text consisted of simple and coordinating sentences. It was self-designed with guidance from a variety of texts suitable for Standard One children in Malaysia. The text was piloted on three Standard One children without reading impairments to ensure that the text was not too difficult. The three pilot participants gave feedback on comprehension of the text and word difficulty. The full text is included in the Appendix.

Malay Sentences

The Malay sentence task was a short narrative of 76 words and consisted of simple and coordinating sentences. It was designed by the experimenter and based on Standard One-level texts. This text was piloted on three Standard One children without reading impairments to ensure that the text was comprehensible and suitable in terms of difficulty. The full text is included in the Appendix.

Procedure

All the tests were administered in a quiet room at PDM and the school. The unimpaired group was able to complete the PPVT-IV task, the phonological awareness, and reading tasks in one session. The dyslexic group, on the other hand, were tested on the PPVT-IV task in one session and the phonological awareness tasks and the reading tasks were tested in a separate session on a different day. This measure was taken to reduce the effects of fatigue on the results because the phonological awareness and reading tasks were too taxing for the dyslexic participants to complete in a single session. For both groups, the PPVT-IV task was conducted first, followed by the phonological awareness tasks and the reading tasks. The phonological awareness tasks were conducted in similar order for both groups (letter recognition, syllable reading, phoneme deletion [initial, final, and mid]). Only the reading tasks were conducted in random order. Both accuracy and time were recorded for the phonological awareness and reading tasks to reflect fluency.

Results

The data set for the unimpaired group was complete whereas the dyslexic group's data contained gaps in several tasks because some of the dyslexic participants were unable to complete the tasks; Malay sentences, English text, and pseudowords had the fewest responses. Several reasons contributed to the data gaps in the dyslexic group. The main reason is that the participants found the tasks too difficult. This was most evident in the pseudoword and English text tasks. Only two participants who attempted the English Text had some correct responses. But their responses had many errors and one participant was only able to read high frequency monosyllabic words such as *is*, *he*, *was*, *cat*, *not* etc. Five participants attempted the pseudoword task, but no correct responses were recorded. The second reason for the gaps in the data is fatigue. Several participants asked for the testing to be stopped due to fatigue. The dyslexic participants took, on average, three times longer than

the unimpaired group to complete the phonological awareness and reading tasks; the additional time they took to decode words probably contributed to exhaustion. The experimenter was unable to resume testing for participants who claimed fatigue because of time constraints. Due to the lack of Malay sentence, English text, and pseudoword reading data, these three tasks were excluded from the analyses. Table 1 summarises the number and percentage of participants who attempted the tasks.

Number and Percentage of Responses					
Task		Dyslexic (N = 21)	%	Unimpaired (N = 27)	%
English Vocabulary	PPVT-IV	21	100	27	100
Phonological Awareness Tasks	Letter Recognition	21	100	27	100
	Phoneme Deletion (Initial)	12	57	27	100
	Phoneme Deletion (mid)	8	38	27	100
	Phoneme Deletion (final)	10	48	27	100
Reading Tasks	Syllable Reading	18	86	27	100
	Malay Sentences	4	19	27	100
	English Text	2	10	27	100
	Pseudowords	6	29	27	100
	Malay Words	9	43	27	100

Table 1: Number and percentage of participants who attempted the tasks

Phonological tasks

We conducted independent t-tests to compare the accuracy of both groups in the letter recognition and phoneme deletion (word-initial, mid-word, and word-final) tasks. We had to conduct analyses on subgroups instead of the entire group for the mid-word and word-final phoneme deletion tasks due to the lack of data for the dyslexic group. Dyslexic participants who had enough data for the analysis were identified and age matched to participants in the unimpaired group. Despite the small sample, the results matched our prediction. Ceiling effects for accuracy were observed in the unimpaired group for all tasks; they had perfect scores for accuracy on all tasks. The dyslexic group performed significantly poorer than the unimpaired group in all six tasks. However, if the entire sample of dyslexic participants was included in the

analysis, the difference would have been even greater. This finding was anticipated because we predicted that the dyslexic participants' phonological deficit would prevent them from reading fluently and manipulating phonemes in words. Table 2 displays the t-test results for participants' response accuracy for letter recognition, phoneme deletion (word-initial, mid-word, and word-final), syllable reading, and Malay word reading.

Participants' Response Accuracy									
Task	Dyslexic Group			Control Group			df	t-value	Sig.
	N	M	SD	N	M	SD			
Letter Recognition	21	0.77	0.28	27	1.00	0.00	46	-4.20	0.000*
Phoneme Deletion (Ini)	12	0.53	0.31	27	1.00	0.00	37	-8.08	0.000*
Phoneme Deletion (Mid)**	5	0.86	0.12	5	1.00	0.00	8	-2.75	0.025*
Phoneme Deletion (Fin)**	8	0.93	0.09	8	1.00	0.00	14	-2.39	0.031*

Table 2: Independent samples t-test for participants' response accuracy by group

Note: M=Mean. SD= Standard Deviation.

* Significant at $p<0.05$

** Unimpaired participants for these tasks were age matched with participants from the dyslexic group who completed the task

For response times, we selected the letter recognition, phoneme deletion (word-initial), syllable reading, and Malay word reading tasks because these tasks had the most data available. Independent samples t-tests were conducted on the participants' response times for these tasks. Only the times for correct responses were included in the analysis. The results indicate that the unimpaired group was significantly quicker than the dyslexic group for the letter recognition, syllable reading, phoneme deletion (word-initial), and Malay words tasks. We also conducted a paired samples t-test to compare the response times for each item in the tasks. We wanted to identify whether there was a significant difference in the performance between the dyslexic and unimpaired groups on individual items. Similarly, we ran the analyses only on the letter recognition, phoneme deletion (word-initial), syllable reading, and Malay word reading tasks. The unimpaired group responded to the items quicker than the dyslexic group Table 3 displays the results of the t-tests for the participant and item response times.

Participants' Response Times									
Task	Dyslexic Group			Unimpaired Group			df	t-value	Sig.
	N	M	SD	N	M	SD			
Letter Recognition	20	5.03	4.36	27	1.20	0.20	46	4.57	0.00*
Phoneme Deletion (Ini)	10	19.22	15.07	27	3.61	2.61	37	5.29	0.00*
Item Response times									
Task	Dyslexic Group			Unimpaired Group			df	t-value	Sig.
	N	M	SD	N	M	SD			
Letter Recognition	20	4.30	1.15	20	1.20	0.11	19	12.19	0.00*
Phoneme Deletion (Ini)	10	13.47	4.65	10	3.61	1.09	9	6.41	0.00*

Table 3: Independent samples t-test for participant and item response times by group

Note: M=Mean. SD= Standard Deviation.

* Significant at p<0.01

Reading tasks

Due to the data gaps in the Malay sentences, English text, and pseudoword reading for the dyslexic group, we could not compare the performance of both groups on these tasks. The dyslexic group could not complete the tasks, so we do not have statistics for them on these three tasks. Therefore, we only provide the descriptive statistics of these tasks for the control group. Table 4 displays the descriptive statistics for accuracy and time for the unimpaired group on the three tasks. The accuracy of the participants performance in the tasks were calculated in percentage of correct words read and the time recorded was the time (seconds) they took to compete each task. Two participants were excluded for the English text because one was an outlier for accuracy and the other for time; both performed far below the mean accuracy and time of the group. One outlying participant for accuracy in the pseudowords reading task was also excluded; the accuracy score was very low compared to the rest of the group.

Descriptive Statistics						
Measure	Task	N	Min	Max	Mean	Std. Dev
Accuracy (%)	English Text	25	72.44	99.36	89.62	7.35
	Pseudowords	26	64.00	100.00	90.00	10.20
	Malay Sentences	27	95.38	100.00	99.03	1.72
Time (s)	English Text	25	85.83	181.38	131.93	24.16
	Pseudowords	26	39.07	105.70	59.07	18.91
	Malay Sentences	27	29.66	92.20	50.52	15.55

Table 4: Descriptive statistics for percentage of accuracy and time for the unimpaired group on English text, pseudowords, and Malay sentences

Note: Values for accuracy are in percentage and values for time are in seconds (s)

We conducted independent samples t-tests on the response accuracy for both groups in syllable reading and Malay word reading. These were the only two reading tasks that had enough data for analysis. The results indicate that the unimpaired group were far more accurate than the dyslexic group in both tasks. In fact, the unimpaired group were at ceiling level for both these tasks. Table 5 displays our findings for the response accuracy of both groups in the syllable reading and Malay word reading tasks.

Participants' Response Accuracy									
Task	Dyslexic Group			Control Group			df	t-value	Sig.
	N	M	SD	N	M	SD			
Syllable Reading	18	0.69	0.31	27	1.00	0.00	43	-5.21	0.000*
Malay Words**	8	0.76	0.26	8	1.00	0.00	14	-2.57	0.022*

Table 5: Independent samples t-test for participants' response accuracy by group

Note: M=Mean. SD= Standard Deviation.

* Significant at $p<0.05$

** Unimpaired participants for these tasks were age matched with participants from the dyslexic group who completed the task

We also conducted independent samples t-tests for both groups' response times on two reading tasks: Syllable reading and Malay word reading. These two tasks were selected for analysis because we had the most data for these tasks for the dyslexic group. The results indicate that unimpaired group performed quicker than the dyslexic group on both tasks. We also performed a paired samples t-test to compare the response times for each item in the syllable reading and Malay word reading tasks. We found that the unimpaired group were significantly quicker than the dyslexic at responding to each item. Table 6 displays the findings of both t-tests for syllable and Malay word reading.

Participants' response times									
Task	Dyslexic group			Unimpaired Group			df	t-value	Sig.
	N	M	SD	N	M	SD			
Syllable reading	20	12.06	10.57	27	1.16	0.23	43	5.39	0.00*
Malay words	8	6.17	4.94	8	0.98	0.18	14	2.97	0.01*
Item response times									
Syllable reading	20	8.34	2.97	20	1.16	0.11	19	10.86	0.00*
Malay words	10	5.36	1.48	10	0.99	0.10	9	9.85	0.00*

Table 6: independent samples and paired samples t-tests for participants' and item response times by group

Note: M=Mean. SD=Standard Deviation

*Significant at p<0.01

Test type

2-way repeated measures ANOVA tests were conducted on age matched samples for the syllable reading and Malay words tasks to look for an interaction between the groups and tasks based on participant and item response time. We were interested in the interaction between these two tasks because beginner readers in Malay are taught to identify syllables instead of individual phonemes. They are taught to blend syllables to form words. Therefore, the focus is on learning syllables as basic sound units instead of phonemes and letter sounds. As such, we wanted to find out whether there is an interaction between syllable reading and Malay word reading. We predicted that they would be faster at reading syllables than Malay words because the children have had more practice identifying syllables than words. We compared the two groups, dyslexic an unimpaired, with the task types, syllable reading and Malay word reading. The effect of group was marginally significant by participants' response

times and significant by item response times (F_1 (1, 7)=0.44, p=0.051; F_2(1, 9)=0.91, p<0.01). There was no effect of task type by participants' response times and item response times (F_1(1, 7)=0.03, p=0.64; F_2(1, 9)=0.02, p=0.70). The interaction effect was not significant (F_1(1, 7)=0.01, p=0.85; F_2(1, 9)=0.02, p=0.70). This indicates that the unimpaired participants (M=1.15; SE=0.08) responded faster than the participants with dyslexia (M=6.54; SE=2.32) regardless of the type of task (syllable reading and Malay word reading).

Chapter 7: Discussion

We predicted that Malaysian children with phonological deficits would have difficulty decoding words in Malay and English because English orthography is deeper than Malay orthography. We also expected the dyslexic group to take longer to complete the tasks than the control group. Finally, we predicted an interaction between the syllable reading and Malay word reading tasks because of how Malay is taught in schools. Taken together, the dyslexic group's poor performance in the phonological awareness tasks and the pseudowords task point to a phonological deficit. The dyslexic participants perhaps take longer to decode words because their phonological processing is not automatized. Their lack of accuracy in the phoneme deletion tasks, Malay word and pseudoword reading tasks indicate difficulty in mapping letters to sound and manipulating phonemes.

The results of the study confirm most of our predictions. We can conclude that the dyslexic participants were significantly weaker at reading in English than the unimpaired group. We base this conclusion on the disparity between the dyslexic group's performance on the PPVT-IV and the English text reading task. Both the dyslexic and unimpaired groups were tested for English vocabulary size using the PPVT-IV test. The analysis showed that both groups have similar English vocabulary sizes. On the English reading task, however, the unimpaired group managed to complete the English reading task with reasonably high accuracy and speed but most of the dyslexic group could not complete the task. The two participants who had correct responses on this task were unable to decode complex English words. They could only read monosyllabic or high frequency words such as *I*, *you*, *was/were*, *is/are*, *who*, *did*, *family*, *put*, *her*, *hungry*, *chased*, *out*, etc. Therefore, we can still conclude that the dyslexic group had substantially more difficulties decoding English words compared to Malay words.

Our findings in the phonological awareness tasks support previous research that propose speed as a better reflector of reading abilities in shallow orthographies because there are fewer irregular pronunciations (e.g. Wimmer, 1993; Jiménez González & Hernández-Valle, 2000; Serrano & Defior, 2008). This is because readers can map letters to sounds more accurately in a shallow orthography but take longer to do so if they were dyslexic. Our results show that the children with dyslexia performed poorer than the unimpaired group in the phonological awareness tasks and the reading tasks in both speed and accuracy. Although several participants in the dyslexic group performed as well as the unimpaired group in terms

of accuracy, they still took a significantly longer time to complete the tasks. This suggests that time rather than accuracy may be a more accurate assessment of reading tasks in Malay.

The dyslexic children also performed worse on speed and accuracy in the pseudoword reading task. The pseudowords in the task respect the phonotactic rules of Malay but are meaningless and novel. Therefore, the participants had to rely on phonological skills to decode the words. The overall performance of the unimpaired group was much better than the dyslexic group's (although several unimpaired participants made similar errors as the dyslexic group). Our finding in the pseudoword reading task contradicts studies by Wimmer (1993) and Tressoldi et al. (2001) which found differences in pseudoword reading speed but not in accuracy. A possible explanation for the opposing findings could lie in the participants in the studies. In our study, due to the limited number of children in PDM and the lack of a standardised instrument for dyslexia assessment, we could only control for comorbid learning difficulties and the level of their intervention. As a result, our participants ranged wider in terms of age and reading ability compared to the closely controlled participants in Tressoldi et al.'s (2001) study. The bigger age range in our dyslexic group also means that we had more differences in overall cognitive developmental stages because the younger participants are cognitively less developed than the older participants. The participants in Tressoldi et al.'s study, on the other hand, had a mean age of 7.2 years (SD=0.4) so their cognitive development is generally similar.

We compared the available pseudowords reading data we have for both groups. Six dyslexic participants attempted the task, but none had correct responses after three pseudowords. Most of the errors were very close to the target response; elisions and substitutions were the main types of error. Some examples of errors made by the dyslexic participants (and some unimpaired participants) are presented in Table 7.

Target word	Response	Error
Pernak	Pernak → Pernah	Phoneme substitution (Pernah is a real Malay word)
	Pernak → Pena	Phoneme elision
Tolabi	Tolabi → Tobi	Syllable elision
	Tolabi → Tolbi	Phoneme elision
Genara	Genara → Jenara	Phonological substitution
	Genara → Gena	Syllable elision

Table 7: Types of errors in the pseudoword task

The current study was mainly concerned with the differences between the dyslexic group and the control group. Therefore, only the response times for correct responses were taken into account in this study. However, this does not provide much information about how the participants, especially the dyslexic group, process words and the strategies they use for reading. Further research could instead look into analysing the errors to identify possible reasons behind them. The types of errors (e.g. elisions, substitutions, additions) made by the dyslexic group could provide valuable insights into how dyslexic bilingual children process words and the role of phonological awareness in their reading efforts. Such a study would hopefully shed some light on the importance of phonological awareness and how deficits in phonological awareness affect the reading process. It would also help in planning remedial strategies to help dyslexic individuals cope with their disability.

Previous research in spelling among Malaysian children has found that despite the transparency and predictability of Malay orthography, early spelling tends to be based on syllabic and morphemic encoding rather than phonemic encoding (Liow & Lee, 2004). This phenomenon could be caused by the method of instruction in Malay language classrooms. Children learn that when the consonant ‘p’, for instance, is combined with the vowels ‘a’, ‘e’, ‘i’, ‘o’ or ‘u’, the syllables ‘pa’, ‘pe’, ‘pi’, ‘po’, and ‘pu’ are produced (Winskel & Widjaja, 2007). They rehearse these combinations before moving on to CVC and more complex CV syllabic patterns (Dewi, 2003). Based on this, we predicted that the participants would perform better on the syllable reading task compared to the Malay word reading task. We also predicted an interaction between the two tasks.

However, our results do not indicate an interaction between syllable reading and Malay word reading in either group. A possible reason for this could be that the control group are no longer early readers. Therefore, they have already established sight words and no longer rely solely on decoding skills to read. A different result may have been found if the control group was younger. As for the dyslexic group, a possible explanation for the lack of an interaction between syllable reading and word reading could be due to our analysis for Malay words. Due to the limited data for the Malay word reading task, we could only include eight dyslexic participants who were perceived as higher performers because they scored accurate responses for the high frequency items (first 10 words on the list). However, most of the dyslexic participants managed to attempt the syllable reading task so 18 participants (3 were excluded from the total of 21) were included in the analysis. Therefore, whereas our findings for the syllable reading task were representative of the entire dyslexic group, the findings for the Malay word reading task was skewed towards the high performers. As a result, our analysis

did not show a significant interaction between the tasks. If our analysis of Malay words had included all the dyslexic participants, our findings might have been different.

The dyslexic children clearly performed better on the syllable task compared to the Malay word reading task. A possible explanation could be that they may have had more practice with short, monosyllabic non-words compared to Malay words (which usually consist of more than one syllable). Furthermore, the Malay words, despite being high frequency words, were disyllabic and most of the dyslexic children probably have not achieved that reading level yet.

Although the study provided most of the information we were searching for, there are several improvements that should be made if this study is to be replicated. First, we overestimated the abilities of the dyslexic group. The initial instrument for Malay words, pseudowords, and English text were too difficult for them to complete so it had to be simplified. More 2- and 3-syllable Malay and pseudowords were included and the number of 4- and 5-syllable words were reduced. This resulted in some ceiling effects for the control group in these tasks. The ceiling effects were expected even in the original tasks but to a lesser degree. Nevertheless, the revised instrument still showed a significant difference between both groups in the tasks the dyslexic participants were able to complete. Secondly, the gaps in the data, especially in the dyslexic group, make it difficult to draw conclusions with certainty. However, we believe that if the dyslexic participants had been able to complete the tasks, we would still see a significant difference in their performance compared to the control group. We draw this conclusion based on the data collected from the letter recognition, syllable reading, and Malay word reading tasks. If the dyslexic group performed significantly worse than the control group in recognising letters, reading familiar Malay words, and smaller letter clusters (syllables), we can safely predict that their performance on the English text and pseudoword reading tasks would be significantly worse as well. Our data shows that several dyslexic participants had difficulty identifying letters and reading syllables accurately, so they would definitely be at a disadvantage in word reading. Furthermore, the unsuccessful attempts by several dyslexic participants in the English text and pseudoword reading tasks reinforce this prediction. One way to overcome the gaps in the data is to further simplify the tasks so that more participants are able to complete them. Then, we could use speed instead of accuracy as the main measure.

The limited data in our study also prevented a cross-linguistic comparison between Malay and English. The unimpaired group had close to ceiling levels of accuracy in the English

reading text (slightly lower than reading in Malay) so it was difficult to make a comparison. The dyslexic group were unable to complete the English reading text and their data on reading in Malay was also very limited so we could not make any comparisons there. Current literature suggests that children learning to read in two languages could experience cross-linguistic transfer and/or interference. Two leading frameworks in understanding cross-linguistic transfer are linguistic interdependence (Coady, 1997; Cummins, 1979; Verhoeven, 1994) and contrastive analysis (Connor, 1996; Ellis, 1994; Odlin, 1989). The first framework, linguistic interdependence proposes that the first language (L1) and second language (L2) are interdependent and that they rely on a single processing system which manages the proficiency of both languages (Cummins, 1991). The implication is that the development of the L1 can aid the development of the L2 (Cummins, 1979). The second, contrastive analysis, focuses on the similarities and differences in the structure of the languages (Odlin, 1989). These structures can be syntactic, phonological, or semantic. The more similar these structures are between the L1 and the L2, the easier it will be to acquire the L2 (Connor, 1996). For dyslexic bilingual children, this could imply that structurally similar languages would be easier to process than two structurally disparate languages and that their proficiency in one language will help facilitate the processing of the other if the structures of both languages are similar enough (e.g. orthography, phonology, etc.). The data in our study, however, was too limited to investigate this. Future research could look into comparing Malaysian dyslexic children's performance on reading in Malay and English to discover if learning phonological skills in Malay facilitates reading acquisition in English. If indeed phonological strategies for reading in Malay aid reading in English, this would have implications on teaching young dyslexic children (i.e. teachers should first teach young dyslexic children phonological awareness in Malay before teaching them to read in English).

Future research should aim to design a standardised reading assessment because there is, presently, no such assessment in Malaysia which can be used for diagnosing dyslexia and other literacy impairments. The main problem encountered in this study was the lack of a standardised measure of assessing reading that can be used as a reference/base line to assess reading abilities. To do this, the first course of action would be to collect data on vocabulary size and word frequencies according to age (similar to PPVT, WORD, and PhAB) to assess vocabulary size/knowledge. The data should encompass students from both urban and rural schools for a better representation of the population. With a standardised assessment of vocabulary size established, other sets of assessment can then be constructed to address different types of language disorders. To diagnose dyslexia, the battery of tests should include non-lexical, phonological awareness and reading tasks. The toughest part would be choosing

which tests to include, testing the reliability of those tests, and designing a procedure to administer those tests (taking into account time for completion, cognitive load, attention span etc.). Tasks like letter knowledge, phoneme deletion, rhyme, and non-word reading seem to be quite effective in identifying weaknesses in phonological awareness (e.g. De la Calle et al., 2017; Winskel & Widjaja, 2007; Bryant et al. 1990; Ehri et al., 2001; Rack et al., 1992). These tasks could be included in the assessment to identify different aspects of phonological awareness weaknesses.

Chapter 8: Conclusion

The dyslexic group's poor performance in the phonological awareness and reading tasks provide evidence that dyslexic children in Malaysia experience phonological deficits. We found that bilingual Malaysian children with dyslexia have phonological deficits that prevent them from decoding words efficiently. This is evident from their poor performance in the phonological tasks and the limited data in the reading tasks; they made significantly more errors on the phonological and word reading tasks. They also took much longer to complete the tasks compared to the unimpaired group. The dyslexic children faced more difficulty decoding words in a deeper (English) orthography compared to a shallow (Malay) one. Some of the dyslexic participants were able to read the Malay words, in contrast, only two participants managed to read high frequency and monosyllabic words in the English reading tasks although they had comparable knowledge of English vocabulary. Several dyslexic participants managed to perform at ceiling level accuracy in the letter recognition, syllable reading, and phoneme deletion tasks. However, they were still significantly slower than the unimpaired group. We speculate that in shallower orthographies such as Malay, speed is a better predictor of dyslexia than accuracy whereas in a deeper orthography like English, both accuracy and speed can predict dyslexia. As a whole, our findings indicate that the dyslexic participants are less fluent in reading because of phonological deficits. Their phonological processes are not automatized so they require more cognitive effort to decode words. Their phonological deficits also cause difficulties in mapping letters to sounds and manipulating individual sound in language.

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Appendix

Phonological Awareness Tasks

Letter Recognition

1. p
2. l
3. m
4. o
5. u
6. i
7. h
8. r
9. y
10. d
11. w
12. q
13. f
14. k
15. c
16. g
17. s
18. a
19. j
20. b

Phoneme Deletion

Word Initial

1. **k**awan = awan
2. **b**oleh = oleh
3. **u**paya = paya
4. **b**otak = otak
5. **t**aman = aman
6. **b**ulat = ulat
7. **m**akan = akan
8. **b**arang = arang
9. **s**emak = emak
10. **s**ambil = ambil

Mid-word

1. ka**i**n = kan
2. te**m**pat = tepat
3. dar**j**ah = darah
4. mer**d**eka = mereka
5. ma**s**in = main
6. bu**l**at = buat
7. ba**n**tu = batu
8. man**j**a = mana
9. ku**l**at = kuat
10. si**k**ap = siap

Word Final

1. kamu**s** = kamu
2. hidu**p** = hidu
3. tahu**n** = tahu
4. bulu**h** = bulu
5. muda**h** = muda
6. masa**k** = masa
7. lama**n** = lama
8. kayu**h** = kayu
9. kota**k** = kota
10. bawa**h** = bawa

Reading Tasks

Syllable Reading

1. ba
2. lo
3. pa
4. ta
5. hu
6. ke
7. mi
8. fa
9. ku
10. ro
11. ga
12. bi
13. lap
14. mat
15. yip
16. dan
17. hon
18. tun
19. ken
20. dis

Pseudoword List

1. pernak
2. tolabi
3. genara
4. borua
5. iroma
6. geranta
7. agarasa
8. setemes
9. peralan
10. menilur
11. setarang
12. risihi
13. yabikan
14. keluncat
15. cengampal
16. manderang
17. berpertau
18. seningku
19. kidahila
20. kampira
21. dangkulu
22. paridata
23. menkil
24. bahad
25. depatiku

Malay Word Reading List

1. bola
2. baju
3. ibu
4. buka
5. suka
6. labu
7. cicak
8. meja
9. rumah
10. cikgu
11. keluarga
12. meriah
13. kawasan
14. pakaian
15. selesai
16. cerita
17. tuala
18. makanan
19. pelajar
20. mengapa
21. ingat
22. dahulu
23. nyamuk
24. sambutan
25. tangan
26. sesuatu
27. perkataan
28. panggil
29. selamat
30. ceria
31. semangat
32. arahan
33. perpustakaan
34. tetapi
35. kesihatan
36. lawatan
37. pertandingan
38. beberapa
39. buah
40. senaman

Malay Sentences

1. nama saya ali.
2. umur saya lima tahun.
3. hari ini hari jadi saya.
4. ibu beli ayam kfc untuk saya.
5. ayah pula membeli sebuah basikal untuk saya.
6. basikal itu berwarna hijau dan sangat cantik.
7. kakak dan abang membeli sepasang kasut untuk saya.
8. kasut itu berwarna biru dan mempunyai corak putih.
9. biru dan putih adalah warna kegemaran saya.
10. saya berasa sangat gembira kerana keluarga saya sangat menyayangi saya.

English Text

Once upon a time, there lived a goldfish named Rami who lived in a fishbowl. The bowl was made of clear glass and it was spacious. Rami had plenty of space to swim around. Sometimes he would hide behind the rock and sometimes he would stay under the pretty bridge. There was a sign in the Rami's fish bowl that said "No Fishing". Rami felt safe with that sign. But Rami's family had a cat named Didi. Didi was always trying to catch Rami. She would wait to see if the family was watching and put her paw into Rami's fishbowl. Didi could not read the sign in Rami's fishbowl so Rami was not safe from Didi. One day, Didi felt hungry so she tried to catch Rami. This time the family saw Didi. They quickly chased Didi out of the house and moved Rami's fishbowl to a safe place. Now, Rami was safe from Didi.