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Phonological Errors in English among Dyslexic Learners in Selected Primary Schools in Penang: Phoneme, Syllable and Word Levels

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ABSTRACT

Dyslexia is a learning difficulty primarily characterised by the deficit of phonological awareness which includes representing, storing and retrieving speech sounds. Past research has identified the influence of dyslexia in learning English as a second language (ESL). Presently in Malaysia, data that link dyslexia and phonology in English as L2 is scarce. Thus, this study aimed to identify the phonological errors, specifically at the phoneme, syllable and word levels in English among dyslexic learners in selected primary schools in Penang. It also differentiated phonological errors made by dyslexic and non-dyslexic learners in the same context. This study adopted the phonological awareness assessment that consisted of tasks at different phonological levels. The sample included seven dyslexic learners aged ten, and seven non-dyslexic learners with matched age. Overall, the findings suggest that dyslexic learners made significantly more errors than non-dyslexic learners based on the average scores of each task, with the lowest average score of only 28% in the non-word reading task. The results also reveal that dyslexia posed substantial problems in English as L2 learning, as well as the need for structured language programmes for dyslexic learners.

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INTRODUCTION

Dyslexia has been termed as a specific language-based learning difficulty that affects reading, writing, spelling

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and numeracy skills (British Dyslexia Association, 2010). Based on extensive evidence of past researches, the main underlying factor that leads to difficulties in literacy skills among dyslexics is the problem with phonological awareness or phonological processing skills (Ecalle et al., 2009).

Phonological awareness difficulties in dyslexics mostly occur in the principle of letter-to-sound (grapheme-phoneme) relationship. The interference in the process of establishing links between written letters and spoken sounds affects the word recognition system, thus resulting in difficulties of reading and spelling out words, as well as poor access to phonemes (Ramus, 2004; Snowling, 2000).

Morton and Frith as cited in Kelly and Phillips (2011) suggested a causal modelling framework in representing theories of causation in relation to dyslexia. The causal modelling framework in Figure 1 discusses three main components which are biological, cognitive and behavioural.

Based on the model, it is summarised that there are three levels of theories of causation for dyslexia involving interaction at all levels with the environment. The biological factor is reflected in the form of the abnormality of the cerebellar. The abnormality affects cognitive functions such as the phonological deficit, motor deficit and sequencing deficit. The deficits are then reflected by poor reading, writing and spelling, and poor motor balance.

Dyslexia in Malaysia

According to Gomez (2004), the concept of dyslexia as a learning difficulty is still very much in the infancy stage in Malaysia. However, for the past several years, dyslexia has gained serious attention and support from the government by taking into account dyslexia in the mainstream school education system. As of March 2004, the Ministry of Education Malaysia (MoE) in collaboration with the Special Education Division has introduced a dyslexia programme in selected schools across the country.

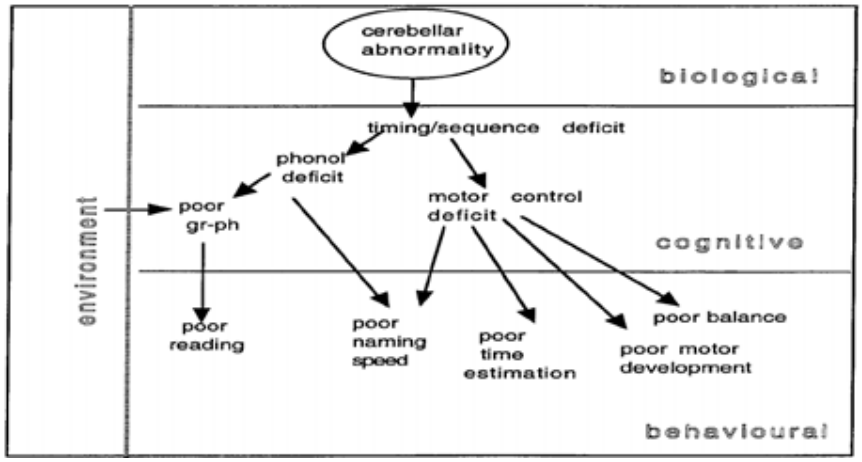

Figure 1. Morton and Frith's causal modelling framework (Philips et al., 2013)

The availability of statistical data on dyslexic children in Malaysia is still very much in its early stage. Ministry of Education Malaysia in July 2012 has published data on the comparison between the numbers of children enrolled in special education system against the total number of children enrolled in government-run schools. Meanwhile, 2013 has shown an increase in the number of children enrolled in special needs education with approximately 54 000, which remains at one per cent of the total number of students enrolled (UNICEF Malaysia, 2014).

The growing number of dyslexic children in Malaysia has prompted the MoE to introduce a dyslexia screening test for primary school pupils, known as *'Instrumen Senarai Semak Disleksia'* (ISD) (Bahagian Pendidikan Khas Kementerian Pelajaran Malaysia, 2011). The screening instrument allows for teachers to identify dyslexia children using a checklist of 50 items from three elements; namely the level of proficiency in spelling, reading and writing, pupil's strengths, and pupil's weaknesses. The ISD is tested on pupils who show specific symptoms of being dyslexic.

In terms of academic support by the MOE through the Special Education Division, there are currently three options available in the national school system for dyslexic pupils. They are Special Education Schools, Special Education Integrated Programmes (SEIP) and Inclusive Education Programmes (UNICEF Malaysia, 2014). Despite the initiatives and support provided by the MOE through the Special Education Division in the national schooling system, the level of awareness of dyslexia in Malaysia is still relatively low. Furthermore, special education schools and programmes are yet to be made available in all schools throughout the country. Research done on difficulties and language errors by dyslexic learners are also sparse in Malaysia.

Role of Phonological Awareness

Phonological awareness refers to the ability to focus on and manipulate individual sounds (phonemes) as the smallest unit of sounds in words and utterances independent from their meanings (Stackhouse et al., 2002). Phonological awareness is a skill developed at an early age in children through explicit instruction for reading. Beginner readers are required to learn the concept of phoneme-grapheme (Kovelman et al., 2012). The process of grapheme-phoneme correspondence (GPC) in normal-performing individuals occurs as an automated process. However, individuals with a phonological deficit namely dyslexics struggle with decoding letters and blending them into sounds, especially for unfamiliar words, and vice versa.

Phonological awareness in children develops along a continuum from tacit to explicit awareness. Figure 2 shows that phonological awareness is the collective result of auditory, articulatory and orthographic processes. The most basic form of analysis is the syllable segmentation, followed by rhyming and blending. As the developmental progression of phonological awareness moves towards the right in Figure

2, the level of analysis becomes more complex and demanding of phonological skill (Stackhouse et al., 2002).

It is suggested that a deficit in phonological awareness is the core characteristic of dyslexia (Bradley & Bryant, 1978; Wagner & Torgensen, 1987). This view was supported by Stackhouse et al. (2002) in which he stated that problems with phonological awareness tasks and literacy development were prevalent in children with persisting speech and language difficulties. In the case of dyslexia learners, they usually have poor phonological awareness in which they struggle with phonemically-demanding tasks.

To sum up, phonological awareness is essential to understand the underlying alphabetic principle of the written language system. Sensitivity towards phoneme sounds of language and words is necessary for learning to read for young children. For the past years, research has concluded that phonological awareness is in close relation to literacy development, specifically in terms of reading proficiency. Early reading requires the ability to understand and manipulate phonemes for successful reading. In short, success in early reading is dependent on having a certain level of phonological awareness. For this reason, children with reading difficulties often demonstrate poor phonological awareness. Thus, it is clear that phonological awareness plays a crucial role in determining reading and spelling success.

Dyslexia in Learners of English as a Second Language

Lerner and Johns (2009) added that the cultural background and environment also contributed to the difficulty in learning the English language. In the local context, for example, many children in Malaysia speak only their native language at home and have considerable difficulty in English despite receiving continuous instructions in the schooling system (Maros et al., 2007). Lerner and Johns (2009) stated that English language skills in learners of English were built upon a child's native language. In addition, Miller et al. (2006) and Lundberg (2002) also argued that students who experienced learning difficulty in their native

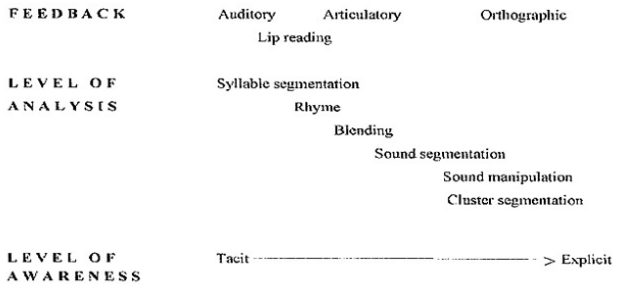

*Figure 2.*The development of phonological awareness skill (Stackhouse et al., 2002)

language also showed problems in English as a second language. In other words, language problem in the first language (L1) will most likely be reflected in the second language (Gerber & Durgunoglu, 2004; González, 2002; Miller et al., 2006).

Furthermore, L2 proficiency also differs considerably in learners. Individual factors such as motivation and anxiety play a role in the varied achievement of L2 learning. Nonetheless, phonological skills in L1 remain as the most promising predictor of L2 learning success (Sparks & Ganschow, 1991). Impairment in L1's phonological processing skill can negatively affect the proficiency level in L2 (Helland & Kaasa, 2005). To account for such assumption, Sparks and Ganschow (1993, 1991) proposed the Linguistic Coding Differences Hypothesis (LCDH). The hypothesis suggests that the learning of L1 and L2 is dependent on basic language components that are present across all languages. Additionally, the hypothesis also argues that difficulties in L1 skills may lead to low performance of L2.

Another issue related to dyslexia in English as L2 is that dyslexia translates in accordance with the orthography or typography of a language (Smythe & Evarett, 2000). Spencer (2001) had noted that transparent orthographies were more accessible to dyslexic children, as they required less demand on memory. In contrast, deeper orthographies such as English are more memory-dependent and may decrease the reading and writing fluency of dyslexic children (Andreou & Baseki, 2012) in English as L2. Spencer (2001, 2000) had also discussed the inclusion of redundant letters and consistency of sound representation in English to be the two main factors in reading and spelling deficits among English as L2 dyslexic children.

Problem Statement

Since the establishment of the Dyslexia Programme in selected schools in Malaysia in 2004, the number of students identified as dyslexic has increased and the latest data provided by the MoE have recorded a total of 50, 738 student enrolment in Special Needs Education in the year 2012 alone (UNICEF Malaysia, 2014). It has widely been agreed by researchers (Liberman & Shankweiler, 1991; Sela, 2014; Stackhouse et al., 2002; Sparks, 1995; Stanovich, 1988) that the core underlying reason for the reading, writing and spelling difficulties in dyslexia is a deficit in phonological processing.

Although there have been many accounts of studies done of the phonological deficit in dyslexia, studies which explored how dyslexics cope with learning English as L2 have been few so far (Łockiewicz & Jaskulskaa, 2016). To date, studies on dyslexia in English as L2 have been carried out in Arabic-English (Abu-Rabia & Sammour, 2013), Greek-English (Andreou & Baseki, 2012), Norwegian-English (Helland & Morken, 2015; Helland & Kasaa, 2005), Persian-English (Akhlaghi et al., 2013), Chinese-English (Ho & Fong, 2005), Dutch-English (Morfidi et al., 2007), and Danish-English (Elbro et al., 2012).

Within the area of dyslexia research in Malaysia, there has been no attempt to specifically look into the errors made by dyslexic students in English as L2. Although there had been several studies conducted in relation to dyslexia in Malaysia, these studies mainly focused on dyslexia in the Malay language (Awang Bolhasan, 2009; Mohammad, 2012; Ruzanna & Letchumy, 2013). Meanwhile, studies involving dyslexia in the context of English language learning in Malaysia have only investigated the use of technology and multimedia as learning assistance for dyslexic learners (Balakrishnan et al., 2015; Ismail & Jaafar, 2014). The phonological difficulties and errors faced by dyslexic students in English language learning have yet to be the focus of studies done on dyslexia in the context of Malaysia.

In addition, the study is also motivated by the scarcity of data on dyslexia in English as L2 in the context of Malaysia. Findings from past studies have unanimously shown that the inconsistencies and irregularities of the phonological and spelling system of the English language resulted in higher errors made by the dyslexic children (Abu-Rabia & Sammour, 2013; Andreou & Baseki, 2012; Helland & Kaasa, 2005), thus contributing to the urgent need for research on dyslexia in English as L2 in the local context.

Furthermore, the bulk of research done on dyslexia concerns with English as the native language. Based on the evidence of scarce research done in the field of the phonology of dyslexic students in Malaysia as English language learners, the researcher hopes to fill the gap especially in the area of phonology in English among dyslexic learners. Previous research in Malaysia has only focused on the spelling of dyslexics in the Malay language. Hence, this study aims to acknowledge the phonological difficulty of dyslexic learners in English by exploring the types of phonological errors made by dyslexics in their L2.

Research Questions

This study seeks to investigate the aspect of phonological difficulties of dyslexia English language learners specifically in selected primary schools in Penang. The main research questions of this study are as follows:

1. What are the phonological errors in English among dyslexic learners in selected primary schools in Penang at the phoneme level?
2. What are the phonological errors in English among dyslexic learners in selected primary schools in Penang at the syllable level?
3. What are the phonological errors in English among dyslexic learners in selected primary schools in Penang at the word level?
4. What are the differences of phonological errors in English between dyslexic and non-dyslexic learners in selected primary schools in Penang at the phoneme, syllable and word levels?

Literature Review

There are currently three major theories that

are the most prominent in the discussion of dyslexia. The three theories are phonological deficit theory, magnocellular deficit theory and cerebellar deficit theory. All three theories offer an explanation of why literacy is affected, particularly on reading. Kelly and Phillips (2011) also included the role of genetic and hemispheric influence to support the biological level in Morton and Frith's (1995) causal modelling framework. They believed that the three main theories might be inter-related rather than distinct approaches.

Developmental dyslexia may be most prevalent in children, but it persists throughout life into adulthood. Nevertheless, developmental dyslexia varies in its symptoms in accordance with age, severity and also the presence of intervention strategies (Bruck, 1990). Developmental dyslexia has been extensively discussed based on its causal theories. The theories include the magnocellular deficit theory, cerebellar deficit theory and phonological deficit theory. Among these theories, the phonological deficit theory has been the most widely accepted.

Phonological Deficit Theory. Currently, the most dominant theory of dyslexia is the phonological deficit theory (Ramus et al., 2003; Snowling, 2000). Many studies have shown that poor phonological processing skillsets apart dyslexic from non-dyslexic individuals. Poor phonological processing skill is also able to predict later reading difficulties due to difficulties in learning the alphabetic principle that letters represent sounds (Bryant & Bradley, 1990; Lundberg, 2002; Snowling, 2000). Phonological deficit improves with age but is still prevalent in adult dyslexics. For example, a study by Ramus et al. (2003) found that all 16 subjects of adult dyslexics used in the study had a phonological deficit. In addition, evidence from research shows that the majority of dyslexics experience difficulties in phonological processing, especially those in English-speaking countries. This may be related to the deep orthography of the language that consists of irregular and complex grapheme-phoneme relationship.

A further argument on the phonological deficit theory lies in the cause of a phonological processing deficit (Nicolson & Fawcett, 2008). Snowling (2008) maintained that the functioning of the cerebellum also offered a direct link to the cause of deficit in phonological processing skill. Her earlier studies (Hulme & Snowling, 1992) proposed that the cause of reading difficulties was the problem in retrieving phonological codes stored in long-term memory. Previously, the phonological deficit theory was only widely discussed in dyslexia in the first language. However, this theory also applies to L2 learning difficulty of dyslexics as evident in many studies of dyslexia in L2. Most recently, Soroli et al. (2010) explored the theory of phonological deficit in dyslexia from the angle of second/foreign language learning.

Previous Similar Studies. The past studies mentioned had all showed a conclusive finding that dyslexic individuals performed poorer than non-dyslexic individuals, both

in adults (Dickie et al., 2013; Suarez-Coalla & Cuetos, 2015) and children (Tiadi et al., 2016; Tilanus et al., 2013). The central element that was found problematic for dyslexic individuals in all studies is the phonological task. The results are in line with the phonological deficit theory which claims deficit in the phonological processing is the central causal of dyslexia (Ramus, 2003). To date, there are few studies that have investigated dyslexics learning English as L2 (Abu-Rabia & Sammour, 2013; Akhlaghi et al., 2013; Andreou & Baseki, 2012; Helland & Morken, 2015; Helland & Kaasa, 2005; Łockiewicz & Jaskulska, 2016). The central findings of the studies show that the performance of dyslexics varies in accordance with the complexity of a language.

A number of studies have been carried out to compare errors in L2 of dyslexic children and normal performing children. Andreou and Baseki (2012) explored on spelling mistakes among dyslexic and non-dyslexic children learning Greek and English. The key findings of the study stated that generally dyslexic children made more mistakes as compared to non-dyslexic children. From the findings of the study, the variations of errors made are possibly due to the nature of English phonology that consists of inconsistent phoneme-grapheme relationship.

Perhaps the most exhaustive work on dyslexia in English as L2 was done by Helland and Morken (2015) in a longitudinal study in the span of seven years on dyslexic children. The study was done to find valid neurocognitive precursors of literacy development in L1 (Norwegian) and L2 (English). A wide range of standardised assessments covering language and literacy development was carried out. The tasks employed in this study were all standardised dyslexia assessment adapted by the researchers in accordance with the local and cultural context of the study.

Moving on, the most recent study on dyslexia in English as L2 was done by Łockiewicz and Jaskulska (2016) in which they investigated the difficulties of reading and spelling in L2 English of Polish dyslexic students. The study included a comparison of the reading and spelling performance of dyslexic students with a group of non-dyslexic students. The tasks included vocabulary task, real word reading task and non-word reading task. It was highlighted in their findings that the dyslexic students were less accurate and less fluent in the reading of real and non-word tasks both in L1 and L2 in comparison with the non-dyslexic students.

Overall, based on the studies done on dyslexia in English as L2 (Abu-Rabia & Sammour, 2013; Andreou & Baseki, 2012; Helland & Kaasa, 2005) in which English is compared to less opaque L1 language systems, in terms of the performance of dyslexic children in both languages, the findings unanimously show that the inconsistencies and irregularities of the phonological and spelling system of the English language resulted in higher errors made by the dyslexic children. Other studies have also concluded that the phonological deficit plays a central role in the learning

difficulty of dyslexia learners (Akhlaghi et al., 2013; Helland & Morken, 2015; Łockiewicz & Jaskulska, 2016).

The bulk of research done on dyslexia in Malaysia focused on the difficulty faced by dyslexic learners in terms of Malay spelling. Mohammad (2012) carried out a study investigating dyslexics who had a problem with spelling from the aspects of learning the Malay language. The focus of this study was on the language learning and the analysis of spelling errors which emphasised on visual and auditory problems in dyslexics. In addition to that, a subsequent study by Ruzanna and Letchumy (2013) concerning spelling difficulties in dyslexia was done carried out. Similar results were found as in the previous study by Mohammad (2012), hence supporting a general conclusion that dyslexic students struggle in spelling in the Malay language.

A relatively recent study done by Oga and Haron (2012) took on a slightly different approach. This study used a phenomenological approach to investigate the life experiences of dyslexics in Malaysia. They explored the dyslexics' perceptions and views about being dyslexic in the Malaysian context by employing an individual semi-structured interview. An interesting result from the study that appeared to be unique to the Malaysian context was that the subjects agreed that they felt subjected to watchful eyes and negative reactions from society.

In addition to that, studies done on dyslexia in Malaysia has also looked into the area of the use of Information and Communications Technology (ICT) and multimedia as learning tools for dyslexic learners. Umar et al. (2011) investigated the use of interactive multimedia in helping dyslexic students cope with their numeracy skill. In another study, Ismail and Jaafar (2014) also undertook the element of multimedia as a learning tool for primary school dyslexic students.

Lastly, only one study of dyslexia in Malaysia has targeted English language learning among dyslexic students. The most recent study carried out by Balakrishnan et al. (2015) took on the approach of investigating the performance of dyslexic learners through the application of multimedia tools as the learning intervention.

All three studies (Balakrishnan et al., 2015; Ismail & Jaafar, 2014; Umar et al., 2011) concluded that ICT and multimedia tools are capable of improving literacy skills in dyslexic learners. Overall, based on the review of related literature, there are very few studies done specifically on the phonological deficit in the English language in the context of Malaysian dyslexic learners.

MATERIALS AND METHODS

The study employed the mixed-method research approach, specifically the explanatory sequential design method as proposed by Cresswell (2014). The researcher had collected data quantitatively based on the test scores from the phonological awareness tasks of the dyslexic and non-dyslexic subjects. The researcher also included the phonetic transcriptions from

the voice recordings to supplement the test scores of the subjects. The phonetic transcriptions highlight the pattern in mispronunciation of words and further provide explanations on the errors made by subjects. Overall, the quantitative data of the test scores was further supported by evidence in qualitative data of errors/ mispronunciations made by subjects.

Sampling

The subjects of this study were selected based on purposive sampling. They were selected from only two specific primary schools in Penang from the dyslexic class. The schools were identified by requesting the information from the Special Education Division, State Education Department, Penang. Only 10 year-olds were selected to participate as the subjects for this study. The availability of the 10-year-old dyslexics is best suited for the study as they are the highest in terms of a number of students, with seven students from both schools. In addition, 10-year old students have received sufficient English exposure as they have undergone three years of English instruction in the Malaysian national schooling system.

Furthermore, subjects were only selected from the national mainstream schools to ensure the validity of the diagnosis. This is because dyslexic students in the mainstream schools have been identified and diagnosed with developmental dyslexia through the ISD with further certification and formally diagnosed by a government medical practitioner. While there are dyslexic learners who could be recruited from dyslexia or language therapy centres, some learners might have an overlapping learning difficulty such as ADHD, slow learner or autism.

The dyslexic students selected are all Malay students with the Malay language as their native language to form a homogenous sample. The control group (non-dyslexic) also consists of seven students selected from the same schools from the mainstream classes. The control group was matched by age, gender and race with the dyslexia group. The inclusion criteria for both groups are that they possessed normal-performing IQ level, free from any psychological disability/ brain damage/medical condition, and literate in English. The control group also had no history of literacy problem, developmental dyslexia and any other learning difficulty as according to their class teachers. Besides that, the control group was selected based on their similar English level based on their English grade in an examination provided by the English teachers. This is to ensure that the control group is homogenous in their English skills.

Research Instrument

This study had employed phonological assessments as the research instrument. The assessments were adapted from Phillips et al. (2013) in *'Assessment of Learners with Dyslexic-Type Difficulties'*. They were adopted in accordance with the cultural and learning context of dyslexic learners in the Malaysian context. The selection of words in the tasks was done based on words from the dyslexic students' official

textbook by the MoE. This is to ensure the familiarity of words for the subjects as well as to avoid errors that would possibly be produced due to unfamiliar words. The word selection for the tasks was tested in a pilot study prior to the actual study. In addition, the phonological awareness tasks were employed in much previous research investigating phonological deficit in dyslexic individuals (Andreou & Baseki, 2012; Dickie et al., 2013; Helland & Morken, 2016; Suárez-Coalla & Cuetos, 2015; Tilanus et al., 2013).

The phonological awareness assessment used in this study consists of four sub-tasks in total from three main categories, which are phoneme, syllable and whole word. The section on 'phoneme blending' in Phillips et al. (2013) was not used in this study due to the poor response from students in the pilot study.

RESULTS

The results of the test scores are calculated in terms of the average score and percentage score of the dyslexic group. As a group, the dyslexic students scored overall much lower than the normal-performing students, with a total average score of 24 out of 25 items (43.6% correct scores). Based on the results, the dyslexic students made several types of phonological errors in the current study based on the assessments conducted. The types of errors include phoneme deletion, syllable segmentation, syllable blending, and non-word reading. The errors occur at the phoneme, syllable and word levels, which show that the dyslexic students have difficulty in all three levels of phonological skill.

Phoneme Deletion Errors

As a group, the dyslexic students only scored an average of 1.85 out of 5 items (37% correct scores) in the task. Their average score for this task is the lowest as compared to other tasks in the study. The result of this task indicates that dyslexic students are particularly poor in phoneme deletion task. This finding echoes the finding by Tilanus et al. (2013) in which they too found that dyslexic individuals performed poorer than controls in phoneme deletion task. However, this result in a sense contradicts the findings by Ho and Fong (2005). In their study, they found that the control group showed an equally poor performance in phoneme deletion.

Furthermore, in this study, it was found that the dyslexic group made the most error in consonant blending stimulus words 'stop' and 'frog'. Three of the subjects committed the error of replacing the vowel in the stimulus word when asked to delete the first phoneme in the stimulus word, producing the word /fɪg/ rather than the targeted answer /rɒg/. Meanwhile, two subjects replaced the vowel 'o' in stimulus word 'stop' with 'i', producing the answer /tɪp/ rather than targeted sound /tɒp/. Besides that, dyslexics also made errors in stimulus words that do not contain consonant blending. Two subjects made an error in the initial phoneme deletion of stimulus word 'cat', in which they exchanged the places of the letters 'a' and 't'. In addition, two students were not

able to perform the task at all due to the severity of their condition. They were not able to manipulate the sounds as stimuli were presented verbally, rather than visually.

Syllable Segmentation Errors

The next type of error produced by the dyslexic group is an error of syllable segmentation, which involves the skill of phoneme counting. The scores show that the dyslexic group performed poorly with the average score record of 2.7 out of a total of five marks (54% of correct scores). Although the dyslexic group's performance in this task is low, two subjects scored full marks on the task. Another trend observed in the dyslexic students' performance in this task is that they did better in longer syllable words as in the stimulus for the words 'computer' and 'television'. This indicates an interesting finding because the overall performance of the dyslexic group shows that their performance decreases with the increase in complexity of stimulus words. However, this particular finding does not agree with such generalisation. This may be due to the familiarity of the stimulus words which exist in their L1.

Syllable Blending Errors

As opposed to the poor performance of dyslexics in the syllable segmentation task, the dyslexic students scored the highest in syllable blending task among other tasks with an average score of 3.57 (71.4% of correct scores). The syllable-blending task proved to be the easiest task for the dyslexic students reflected by the highest record of the average score in comparison with other tasks. Four out of seven subjects recorded full marks for this task. One subject was not able to respond to the longest stimulus word 'beautiful', while two subjects could not perform in the task due to the severity of their dyslexia condition.

Non-Word Reading Errors

In the non-word reading task, the dyslexic group showed particularly poor performance with the record of an average score of 2.85 out of 10 items (28.5% correct scores). The non-word reading error is recorded as one of the lowest performance among dyslexic learners. The non-word reading task especially showed the poor phonological processing skill among dyslexic students, particularly in increasing complexity of CV relationship. Words consisting of CCV, CVCC, CCVC and CCVCC highlighted the difficulty experienced by the dyslexic students in which errors were prevalent in stimulus words containing the mentioned CV strings. For example, the target sound /stɑː/ were pronounced as /tɑː/ and /sæt/, in which subjects were observed to drop the initial phoneme, and as well as rearranged the letters to form CVC word. The same pattern was observed in stimulus words 'kush', 'snat' and 'frang' which involved either phoneme dropping or letter rearrangement reflected in /kʊh/, /kʊs/, /net/, /sʌnʌt/, /sæt/, /frɑː/ and /rʌŋ/ respectively.

Dyslexics vs. Non-Dyslexics Performance

As a group, the dyslexia students scored overall much lower than the normal-

performing students, with an average score of 10.9 out of 25 marks (43.6% correct scores) as compared to the average score of 24.8 out of 25 marks (99.2% correct scores) among the non-dyslexic students. The average score of the non-dyslexic students indicates more than twice higher than that of the score of the dyslexic students. This finding echoes many of the past studies done in dyslexia research (Abu-Rabia & Sammour, 2013; Andreou & Baseki, 2012; Germano et al., 2014; Helland & Kasaa, 2005; Tiadi et al., 2016; Tilanus et al., 2013).

Overall, the performance of the dyslexic and non-dyslexic learners differ in all types of phonological errors produced in English. The differences in the types of phonological errors produced are especially striking in the phoneme deletion errors. Another type of phonological error that shows a striking contrast between the two groups is the non-word reading. This result corresponds with the result of a study by Łockiewicz and Jaskulska (2016). Table 1 illustrates the differences between the two groups based on the types of phonological errors recorded in this study.

Overall, Figure 3 showed the dyslexic group have poor performance as compared to the control group. They recorded particularly low average scores in the phoneme deletion, rhyming, voicing contrasts, minimal pairs and non-word reading tasks with percentage scores of below 50%. The types of errors produced by both groups differ greatly in term of their average and percentage score. The differences occur in the types of phonological errors, which include perception of rhyme, phoneme deletion, syllable segmentation, syllable blending, voicing contrast, minimal pairs and non-word reading.

DISCUSSIONS

The results of the present study reveal that dyslexic students made errors in the phoneme, syllable and word levels of phonological processing. The phonological errors produced by the dyslexic learners are phoneme deletion, syllable segmentation, syllable blending, and non-word reading. The errors made in all levels of phonological awareness were higher than those of the errors made by the control group, indicating that dyslexic students have difficulty in the

Table 1

Average scores of dyslexic and non-dyslexic students in the phonological awareness tasks

Types of phonological errors	**Dyslexia group**	**Control group**
Phoneme deletion (n = 5 items)	1.85 (37%)	5 (100%)
Syllable segmentation (n = 5 items)	2.7 (54%)	4.85 (96%)
Syllable blending (n = 5 items)	3.57 (71.4%)	5 (100%)
Non-word Reading (n = 10 items)	2.85 (28.5%)	10 (100%)
Overall scores (n = 25 items)	**10.9 (43.6%)**	**24.8 (99.2%)**

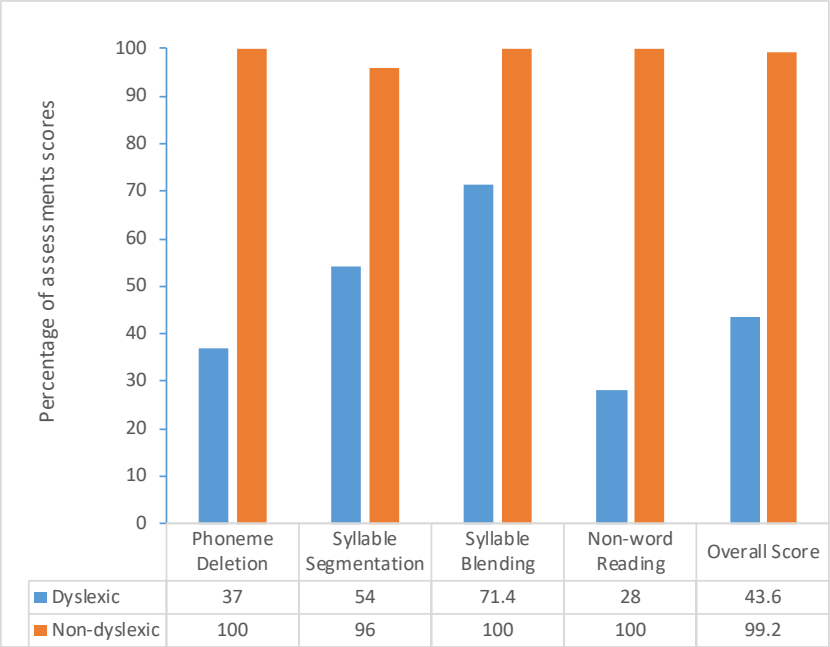

Figure 3. Percentage scores of dyslexic and control group

process of reflecting on, manipulating and storing sounds for efficient phonological processing.

Moving on, the underlying cause of phonological errors most typically recorded by the dyslexic group is the phonological processing difficulty are in regard to the consonant blending, irregularly spelt words and words with complex consonant-vowel string. For words that contain consonant blending such as 'stop', 'frog', 'kush', 'sta', 'glue' and 'frang' from the tasks, the dyslexic students made errors in terms of phoneme omission and vowel/consonant alterations (Abu Rabia & Sammour, 2013; Snowling et al., 1996). For examples, the subjects produced responses such as /tɑː/ (sta), /kʊh/ (kush), /kʊs/ (kush), /net/ (nid), /rʌk/ (bark) and /rʌŋ/ (frang) which shows phoneme deletion from the target words that contain consonant blending. This agrees with the findings by Andreou and Baseki (2012) and Abu Rabia and Amour (2013) in which they observed that dyslexic learners often committed the errors of phoneme omission. Such errors may be attributed to the complex grapheme-phoneme correspondence (GPC) in L2 English.

Overall, the performance of dyslexic subjects does not reflect the development of non-dyslexic children in that they demonstrate apparent difficulty in their phonological processing skill. The difficulty is most commonly reflected in consonant blending words, irregularly spelt words and complex GPC words. They produced several types of phonological errors including rhyming error, phoneme deletion, syllable

segmentation, syllable blending, voicing contrast, minimal pairs and non-word reading.

Recommendations

Considering the results of this study, several instructional implications are suggested for conquering English phonology to L2 English learners in Malaysia. Smythe (2010) suggested that teachers should address specific difficulty faced by learners, such as poor phonological processing. Training in specific areas of difficulty would help learners to develop their skills and thus improve their academic performance.

Kelly and Phillips (2011) proposed structured language programmes that should be specifically developed for dyslexic learners. These programmes utilized phonics-based, bottom-up approaches. Individual phonemes should first be targeted, and then gradually move up to sound blending for word-building, continuing further with the sentence and eventually passages when sufficient phonemes have been introduced to and conquered by learners. Such programmes should also highlight specifically on elements that are absent in the native language but present in the target language to help dyslexic learners grasp the complex phonological elements more efficiently. They also noted the importance of instructions for grammatical features, vocabulary and sentence structure for L2 English learners.

Furthermore, Abu Rabia and Sammour (2013) also implied that additional instructional emphasis on elements that did not exist in L1 was also important in overcoming difficulties for dyslexic learners. This recommendation is in line with Treiman's (1993) conclusion which highlights the need for more time and effort in instruction for elements that were found to be more difficult than others.

CONCLUSION

This study presents significant insights into the understanding of phonological awareness skill in relation to dyslexia in the context of learning English as L2 in Malaysia. The results have highlighted the urgency for intervention measures in teaching methods to cater for dyslexic learners learning in English as L2. It is concluded that dyslexic learners face phonological difficulty at all phonemic levels. Based on this deduction, dyslexic learners should be exposed to these specific elements for learning remedial or interventions in schools.

It should be noted that the study was limited to the participants from dyslexia class in mainstream schools of one state only, and are not necessarily representative of the overall dyslexic population. Future considerations of this study should include bigger samples by including participants in mainstream schools from other states in Malaysia to increase the generalisability of the study. However, the data maintains that specific learning methods should be implemented and integrated into mainstream schools to ensure the inclusion of dyslexic learners in learning English as L2.

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