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The effectiveness of synthetic phonics in the development of early reading skills among struggling young ESL readers

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ABSTRACT
A quasi-experimental research design was used to investigate the effectiveness of synthetic phonics in the development of early reading skills among struggling young English as a second language (ESL) readers in a rural school. The pretest and posttest, adapted from the Phonological Awareness Literacy Screening (PALS) for Preschool Students and Grades 1 to 3 tests, assessed children’s early reading skills. A semi-structured interview was used to gather information. The findings indicated that the performance of students in the experimental group in decoding was significantly higher in the posttest, where t(39) = 31.441, p < .00005. Likewise, in comprehension, the experimental group achieved significantly higher scores in the posttest, where t(39) = 15.322, p < .00005. There was a significant difference in the achievement between the two groups, where t(78) = 31.010, p < .00005. This indicates that synthetic phonics could be effective in developing early reading skills for struggling readers.

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KEYWORDS
Synthetic phonics; decoding; comprehension; early reading skills; ESL students

Background
In Malaysia, the difference in literacy rates between students in rural and urban areas is a cause for concern. Since 1989, the literacy rate in rural areas has been lower (84.3%) than in urban areas (approximately 90%) (Department of Statistics Malaysia [DSM], 2009). The 2010 statistics show that the literacy rate in rural areas was lower (94.5%) than in urban areas (98.3%) (DSM, 2013). Specifically, the state of Kelantan, which has the second largest proportion of rural population (886,776) in Peninsular Malaysia, has the lowest literacy rate (90.4% in 2000 and 95.7% in 2010) (DSM, 2012, 2013). This is so despite the slight increase in the literacy rate in the year 2010.

Lehr and Osborn (1994) believe that the development of literacy is a result of being familiar with literary pieces, as well as having the core skills of being able to identify and decode words. The development of literacy is aligned with the development of reading skills (Hedgcock & Ferris, 2009). Alvermann and Phelps (1998) highlighted that deciphering the written text is an important skill. A weak foundation in reading and the lack of these skills make children less familiar with literature and hence, limit their reading ability (Hedgcock & Ferris, 2009).

In 2004, the Education Development Master Plan (PIPP) indicated that 115,000 (7.7%) primary students across Malaysia had not mastered basic reading, writing, and arithmetic skills (Ministry of Education Malaysia [MOEM], 2006). The Malaysian Education Blueprint 2013–2025 has noted that the literacy rate has not improved much since 2004 (MOEM, 2012). The overall performance of Malaysian students in the Programme for International Student Assessment (PISA) for reading,
mathematics, and science was poor, as Malaysia was ranked in the bottom third section, among 74 participating countries (MOEM, 2012). With the current predicament in the Malaysian education system, a transformative effort is required to revamp instructional strategies for the development of reading skills in order to reduce illiteracy.

A poor mastery of reading skills may be the major contributor to the poor literacy rate in the state of Kelantan. Snow, Burns, and Griffin (1998) established a clear relationship between the development of reading skills and academic success, as poor readers usually have poor academic achievement, which in turn affects their performance throughout their entire schooling. In addition, low socioeconomic status (SES) has an impact on children’s reading development (August & Hakuta, 1997; Lesaux, 2012; Tabors & Snow, 2001). Children from underprivileged families have very limited exposure to English and receive limited support in learning the language. Blachman, Tangel, Ball, Black, and McGraw (1999) stated that children with low SES have lower reading outcomes when using English as a second language (ESL). With limited exposure to English, the children are at risk of developing permanent reading difficulties. Hence, an intervention to address the problem of weak reading skills is urgently needed.

**Reading in a second language**

Children with poor reading strategies have difficulties in reading in a second language (L2). Blevins (2006) terms the deficiency of skills in reading as strategy imbalance. Research has shown that alphabet recognition and phonemic awareness are strong predictors of reading success (Adams, 1990; Beck, 2006; Chall, 1996; Stanovich, 1992). Blevins (2006) also notes that both these elements are inseparable as knowledge on alphabetic principles enriches phonemic awareness, thus contributing to reading success. However, having only alphabet recognition and phonemic awareness skills is insufficient for acquiring reading proficiency.

Reading is the process of acquiring skills-based competencies for the mechanics of reading, and knowledge-based competencies for developing comprehension skills (Lesaux 2012). A number of studies indicate that reading is related to comprehension skills (Carlson, Jenkins, Li, & Brownell, 2013; Suggate, Schaughency, & Reese, 2013; Vadasy & Sanders, 2011). In developing early reading skills, both the mechanics or decoding skills and comprehension skills are seen as inseparable elements (Lonigan, Purpura, Wilson, Walker, & Clancy-Menchetti, 2013). Code-related skills refer to the acquisition of alphabetic principles, which help children to decode text fluently (Lonigan et al., 2013), while meaning-related skills are the ability to extract meaning from the words (Carlson et al., 2013).

The mastery of both decoding and linguistic comprehension skills is essential to the development of reading. The automatic information processing model, one of the process models for reading, describes how information is processed in five stages before it becomes the reading output (LaBerge & Samuels, 1974). This linear process includes decoding visual features, also known as alphabetic recognition, which is the attachment of correspondent sounds and background knowledge, and meaning allocation. The visual memory system, the phonological memory system, and the semantic memory system are the representations of data for input. The visual memory system registers strings of letters and words into spelling pattern codes, the phonological memory system registers phonological representations of letters and words, while the semantic memory system links their semantic representations at word and sentence level (LaBerge & Samuels, 1974; Zainal, 2003). However, the critics of this model state that it does not allow for the effect of syntax on memory, reduces the importance of meaning for comprehension, and interprets reading as being a linear and unidirectional process (Bernardt, 1991; Hassan, 1999; Zainal, 2003).

Interactive models of reading later developed took into account initial encoding processes in which letters and words are registered, as well as characters and spaces, to ensure where to look next for meaning-making (Zainal, 2003). This was followed by lexical access for developing rules to create auditory codes which are applied, and it then continued to the inner speech system for
comprehension processes (Zainal, 2003). Second language (L2) reading models are mainly interactive models as the purpose of reading is for comprehension rather than decoding (Zainal, 2003). However, L2 reading is complex as L2 readers would have previously acquired first language (L1) skills which will influence L2 reading skills.

Componental models such as Coady’s (1979) three-component model consist of conceptual abilities, process strategies, and background knowledge components to explain the interaction of these components on reading. Coady further describes that the concrete processing in process strategies, such as in grapheme-phoneme, grapheme-morphophoneme, and syllable-morpheme, gradually decreases, while the processing of syntax, lexical meaning, and contextual meaning increases as the L2 readers become more advanced (Zainal, 2003). However, this model, as most L2 models of reading, focuses on interaction between the components, and does not take into account the cognitive activities of reading.

Reading ability seems to be related to reasoning ability and memory. Cognition and memory play an important role in L2 linguistic and comprehension tasks (Geva & Ryan, 1993; Zainal, 2003). However, cognitive processes of phonological awareness, rapid naming, and visual processes seem to be associated with reading difficulties in L1 as well as L2, and seem to contribute to the sources of individual differences in both L1 and L2 reading (Geva, 2006). In addition, there seems to be a correlation between processing skills in L1 and L2, which in turn can be used to predict decoding and spelling skills in both L1 and L2 (Geva, 2006).

Koda (1994) has highlighted that lower level verbal processing skills, for example, phonological processing, which is the product of developing phonemic awareness, is important for the process of registering information in working memory in reading. Bentin (1992) defines phonemic awareness as “the ability to detect, isolate, or manipulate sub-word phonological segments (or some combination of the above)” (p. 194). Phonemic-awareness skills are easy to achieve even for struggling readers (Treiman, 1992). There seems to be a relationship between lower level verbal processing skills and reading comprehension (Khatib & Fat’hi, 2012; Koda, 1992).

Working memory capacity is helpful in storing information on speech sounds, matching the letters to sounds and combining them in reading words (Alloway & Copello, 2013). However, the lack of lower level skills seems to strain short-term memory capacity and may inhibit the meaningful sequencing of text integration (Khatib & Fat’hi, 2012; Lesaux & Siegel, 2003). Hence, in line with the processing strategies, phonemic awareness should be developed to enhance phonological processing for enhancing word reading skills (Koda, 1994). Lesaux and Siegel (2003) explain that working memory is an influential factor of reading success. A deficiency in working memory such as verbal memory may affect the development of reading in a second language (Geva & Siegel, 2000).

On the other hand, the background knowledge component emphasizes the knowledge of readers and the text (Weir, Yang, & Yan, 2000). Similar to the view in the linguistic interdependence hypothesis (Cummins, 1979), the background knowledge of readers aids effective reading. In the localized context of Malaysia, Gomez and Reason (2002) comparably indicated that the phonological processing skills gained in L1, the Malay language, have enabled the ESL readers to decode and read in English effectively. The background knowledge of how to read in L1 has shown to be transferable when reading in L2 and has thus benefited in developing L2 reading skills.

**Synthetic phonics and development of reading skills**

Synthetic phonics instruction is seen as an effective approach for developing reading skills as it is an explicit method of teaching that exposes students to step-by-step phonics, from the teaching of individual sounds to the blending and segmenting of sounds (Dixon, Schagen, & Seedhouse, 2011; Lesaux & Siegel, 2003; Vadasy & Sanders, 2011). Synthetic phonics focuses on developing subskills of decoding as well as comprehension. Blevins (2006) outlines four steps in synthetic phonics: (a) teaching letter name knowledge, (b) teaching correspondent sounds, (c) teaching blending in
forming words, and (d) providing opportunities to blend unknown words in context. Davis (2012) adds that this allows for practice in the reading-for-meaning approach.

The effectiveness of this approach has been proven for the development of early reading skills (Dixon et al., 2011; Johnston, McGeown, & Watson, 2012) among struggling readers in the ESL context (Lesaux & Siegel, 2003; Vadasz & Sanders, 2011; Yeung, Siegel, & Chan, 2013). These studies employed experimental research designs for different age groups: kindergarten students (Lesaux & Siegel, 2003; Yeung et al., 2013) and primary school students (Dixon et al., 2011; Johnston et al., 2012; Vadasz & Sanders, 2011). These findings suggest that synthetic phonics may be effective for developing reading skills across gender and language capabilities.

Vadasz and Sanders (2011) found that non-native English first-grade readers benefited from the synthetic phonics teaching, even though it was only implemented for 30 min as individual tutoring, four times a week. Lessons covered the five main components: teaching letter-sound correspondences, phoneme decoding, irregular words, spelling, and oral reading practices. The language-minority students benefited the most in phonological awareness teaching. Interestingly, the researchers found that word-reading and spelling are related to pretest vocabulary knowledge. As proposed in the lexical restructuring model (LRM) (Metsala & Walley, 1998), vocabulary development helps to restructure the representation of words, especially on phonological knowledge. A wider vocabulary helps to restructure the representation of the individual phonemes and thus broaden students’ linguistic perspectives (Fowler, 1991).

In a similar study, Yeung et al. (2013) found that this method of instruction had facilitated the acquisition of phonological awareness, expressive vocabulary, word reading, and word spelling among the ESL kindergarteners, aged 4 to 6. The intervention plan follows a structured sequence of teaching, starting with the teaching of individual sounds and word awareness, syllable segmentation, rhyming, onset and rime, and discrimination. Yeung et al. concluded that phonological awareness predicted the acquisition of word-reading and spelling skills among beginning Chinese ESL readers. Both studies have proven that even short-term synthetic phonics instruction was able to help ESL readers read effectively.

Su and Hawkins (2013) studied the Malaysian context by experimenting with synthetic phonics instruction for the development of early reading skills of emergent readers in Sarawak. In their case study, they implemented Davies and Ritchie’s (2003) THRASS (teaching handwriting, reading and spelling skills) phonics module. The content of this module focuses on developing children’s phonological knowledge structurally, which in turn reflected the synthetic phonics instructional approach. The only difference here is that teaching focuses on developing phonological knowledge by exposing children to the THRASS periodic table of English. Davies and Ritchie (2003) designed this module based on a scientific approach, where the English sounds system is represented in a periodic table according to the phoneme clusters. The THRASS periodic table exposes students to all sounds or phonemes of the English language, including the transparent rules of phonics with the help of pictures. The aim of this module is to develop phonographic metacognition, which will later help in reading development (Davies & Ritchie, 2003).

The findings of Su and Hawkins’ (2013) study indicated that a 7-year-old child was able to apply phonographic knowledge in reading. With a vast exposure to the phonics components such as knowledge on letter-formation, grapheme and phoneme location, and keyword synthesis and analysis, the child and teacher benefited from the implementation of a structured phonics lesson. Even though the child was initially struggling to learn and understand the THRASS periodic table of English, by the end of the study the child was able to master the English sound system. It is evident that exposure to the phonics components such as knowledge on letter formation, grapheme and phoneme location, and keyword synthesis and analysis, had benefits for both teacher and reader (Su & Hawkins, 2013).

There have been concerns raised on the effectiveness of synthetic phonics in developing comprehension skills. Word decoding and linguistic comprehension skills are viewed as two important elements of reading success (Gough & Tunmer, 1986). On the other hand, Stannard
(2006) argued that this instructional strategy contributed to the development of comprehension skills. This is because the nature of synthetic phonics instruction for reading is to develop basic decoding skills (Blevins, 2006). Conversely, Vadasy and Sanders (2011) concluded that word-reading skills and oral language uniquely contribute to reading success in English. A study by Johnston and Watson (2005) similarly revealed a positive effect of synthetic phonics instruction on comprehension skills. Even though the gain was smaller compared to word-reading and spelling, the children’s performance indicated that their reading comprehension skills were significantly ahead of initial expectations, based on their chronological age by the end of the study.

Structural differences, on the other hand, might impede reading development in the L2 context. Cummins (1991) states that bilingualism is either an impediment or facilitator for reading in L2. For native languages that share similarities to English, the skills of reading are suitable for application. LeFrance and Gottardo (2005) support that the similarities between L1 and L2 present potential developmental patterns in reading in a second language. However, in the Malaysian context, the structural differences of the Malay language (native language) to English might be a strong impediment to language learning success among Malaysian students (Awal, Bakar, Hamid, & Jalaluddin, 2007). Additionally, low SES and limited exposure to the target language are disadvantages these children face in developing reading skills (August & Hakuta, 1997; Fry, 2008; Lesaux, 2012; Tabors & Snow, 2001). The study by Blachman et al. (1999) clearly explains that these children usually had limited exposure to English and received poor quality instruction, which could affect their reading development. Nevertheless, these studies have established the positive effect of synthetic phonics in the development of reading skills for ESL students, even from underprivileged backgrounds. The study by Dixon et al. (2011) noted a tremendous improvement among students learning to read in English after receiving synthetic phonics instruction. Students from underprivileged backgrounds in India and with limited exposure to English had improved their reading skills. Therefore, synthetic phonics instruction may be effective for reading as it promotes a “self-teaching device”. This method prepares children to read independently by providing an effective reading strategy (Share, 1995).

**The present study**

Although synthetic phonics instruction is significant for developing reading skills, there is still inadequate evidence to conclude that it can improve the developmental process of reading in the ESL context. Vadasy and Sanders (2011) revealed that “less is known about the effects of early reading interventions for children with limited English language proficiency” (p. 472). Similarly, Lesaux and Siegel (2003) expressed that “little is known about the development of phonological skills or other precursors of reading for children with ESL background” (p. 1005). The diversity of students’ L1 experience from one context to another is a relevant justification behind the above claims. LeFrance and Gottardo (2005) explain that the similarities of a native language to English might benefit ESL readers, but the differences might impede their achievement.

In addition, the available body of research in the area of phonics instructions provides an uncritical basis to the generalization in a different ESL context (Grabe, 2004). Most studies have been conducted on ESL students in English-speaking countries (Lesaux & Siegel, 2003; Lonigan et al., 2013; Shapiro & Solity, 2008; Vadasy & Sanders, 2011); thus, generalizing the findings to a non-English-speaking context of ESL is doubtful. In addition, Yeung et al. (2013) also believe that the generalization of applying the findings to different ESL contexts is problematic and doubtful.

Hence, a study to incorporate synthetic phonics instruction in the Malaysian classroom to investigate its efficacy is greatly needed. The gaps in the current literature show that the potential of success is still uncertain due to the context of the current study, which is ESL in a non-English-speaking L1 environment.
The goal of the current study is to investigate the effects of the implementation of synthetic phonics instruction on decoding and comprehension skills on struggling young ESL readers. It is also aimed at evaluating the effectiveness of this approach in developing early reading skills. In doing so, three keys questions were addressed: (a) What are the effects of synthetic phonics on decoding? (b) What are the effects of synthetic phonics on comprehension? And (c) how effective is synthetic phonics in developing early reading skills? There were two main hypotheses derived from the research questions. Initially, we predicted that there would be no significant improvement on students’ decoding skills after receiving synthetic phonics instruction, and we believed that there would be no significant improvement on students’ comprehension skills after they were exposed to synthetic phonics instruction. These hypotheses were tested by investigating the effects of synthetic phonics instruction on decoding and comprehension skills. The study aims to investigate the effectiveness of the synthetic phonics instruction on the development of early reading skills of struggling ESL readers in a selected school in the rural Gua Musang district.

Method

Participants

Geographically, Gua Musang, with an area of 8214 sq. km., is the largest district in Kelantan and constitutes 54.4% of the area of the state of Kelantan (DSM, 2012). Kelantan has the lowest urbanization rate in Malaysia (42.4%), indicating that most of Kelantan is undeveloped and considered as rural areas (DSM, 2010).

Participants of the study were upper primary school students (aged 11 and 12 years) from a selected school in the Gua Musang district. The population of this school consists of 896 students, almost all of whom are Malays who use the Malay language in the Kelantanese dialect as their L1, with only less than 10 non-Malay students. Students from this school come from average to low socioeconomic backgrounds. A majority of the students receive financial aid from the government throughout the year. Students in this school are exposed to English only during class time (7 to 10 periods, or 3.5 to 5 hr per week) and yearly English panel activities. The medium of instruction in the classroom is a mixture of English, Malay language, and the Kelantanese dialect, depending on the students’ proficiency level.

In 2011, the Ministry of Education implemented the new curriculum, Standardised Curriculum for Primary Schools, which primarily focuses on developing reading through phonics (MOEM, 2011). At the present time, only Year 5 and 6 students across Malaysia are not exposed to phonics instruction. In line with the objectives of the current study, these students were selected as they had not previously received synthetic phonics instruction, which might be a threat to internal validity based on prior learning (Chua, 2012).

From the population, only 105 students were selected based on Oberholzer’s (2005) characteristics of struggling readers in the English language as they: (a) had been identified as having reading difficulties by their teachers; (b) had poor achievement in in-school English tests, indicating they were reading below the expected level for their chronological age; and (c) had undergone or been referred to a remedial program. Some 20 out of 105 students were then randomly selected for a pilot test, to assess the reliability of the test items. The result of the Cronbach’s alpha internal consistency reliability analysis for all the test items suggested that they had a good internal consistency (α = .870). In addition, adequate levels of test-retest reliability were achieved, where the inter-item correlation values between pretest and posttest were high (ranging from 0.799 to 1.000, across 2 months). The test-retest reliability is commonly used in experimental research. The retest was conducted after 2 months in order to avoid memorization of the answers given in the earlier test (Drost, 2011). Next, from the remaining 85 students, 80 students with excellent attendance at school were selected as the final participants of the study. They were divided into
two groups: a control group \((n = 40)\) and an experimental group \((n = 40)\). Table 1 summarizes the characteristics of the sample in both groups. Both groups were closely supervised during the study. The experimental group was placed in a different closed venue during the lessons, but the time frame for the lessons for both groups was similar. In addition, students were unaware that they were part of an experimental study. The teacher in the control group was closely supervised during teaching, to ensure that the lessons did not focus on synthetic phonics teaching elements.

**Assessment measures**

The assessment measures (pre- and posttest) were adapted from Phonological Awareness Literacy Screening for Preschool Students (PALS Pre-K) and Phonological Awareness Literacy Screening for Students in Grades 1 to 3 (PALS 1-3) assessment (Invernizzi, Sullivan, Meier, & Swank, 2004), and the comprehension test was based on a patterned story of “Splish, Splash” (Skarakis-Doyle & Wootton, 1995). There were five sections across two main skills (decoding and comprehension) in the test: (a) name writing; (b) alphabet recognition; (c) combination of individual phonemes, beginning sounds, and rhyme awareness; (d) combination of phonemic awareness and print and word awareness; and (e) comprehension test. Later, the marks of students’ performances in both tests were gathered and analyzed according to their groups (experimental and control). The data were analyzed using the Statistical Package for the Social Science (SPSS) Version 21 to determine the effects of the intervention. The independent sample and paired samples \(t\)-test analyses were used in determining the significant levels in both pre and posttest.

**Name writing.** Students were asked to write down their names and to draw pictures of themselves. Children’s first attempt to convey meaning is through written form, when they write the letters of their name (Welsch, Sullivan, & Justice, 2003). In this test, their answers were assessed according to the rubrics outlined by Invernizzi et al. (2004). The maximum mark is eight.

**Alphabet recognition.** Students’ ability to name all letters in upper and lower case was tested. It is noted that alphabetic knowledge predicts reading success (Adams, 1990; Badian, 2000; Snow et al., 1998). Students were asked to name each letter (26 letters in capital and non-capital).

**Combination of individual phonemes, beginning sounds, and rhyme awareness.** These tests assessed the basic phonological knowledge of the students. In individual phonemes, students were asked to sound each phoneme listed correctly (26 phonemes). In beginning sounds, students were asked to identify the initial sound of all 10 words heard. Lastly, students were asked to select a rhyming word to the words pronounced (10 words).

**Combination of phonemic awareness and print and word awareness.** Students were assessed on their ability to blend phonemes in all 10 words, to name initial, middle, and ending sounds in all 15 words, and to demonstrate their understanding on the mechanics in reading knowledge while reading a short story entitled “Hey Diddle Diddle”, by responding to 10 different instructions.

### Table 1. Demographics of the sample in the control and experimental group.

<table>
<thead>
<tr>
<th></th>
<th>Age</th>
<th>Gender</th>
<th>Financial support</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>11</td>
<td>12</td>
<td>Male</td>
</tr>
<tr>
<td></td>
<td>(n)</td>
<td>(n)</td>
<td>(%)</td>
</tr>
<tr>
<td>Control</td>
<td>30</td>
<td>10</td>
<td>29</td>
</tr>
<tr>
<td></td>
<td>(75.0)</td>
<td>(25.0)</td>
<td>(72.5)</td>
</tr>
<tr>
<td>Experimental</td>
<td>30</td>
<td>10</td>
<td>33</td>
</tr>
<tr>
<td></td>
<td>(75.0)</td>
<td>(25.0)</td>
<td>(82.5)</td>
</tr>
</tbody>
</table>
Comprehension test. There were two subtests in this section. First, students were asked to complete three information gap items, known as the “Joint Story Retell Task Stimuli” (Skarakis-Doyle & Wootton, 1995). Second, they were asked three comprehension questions based on the story “Splash, Splash”.

The total number of questions answered correctly was accumulated for the analysis. These assessments were all conducted in a one-to-one manner, without revealing that they were scored based on their responses given. These assessments were also conducted section by section throughout the first and final week of the intervention plan.

In addition, a semi-structured interview was conducted on the selected eight participants from each group. The selection was based on Chua’s (2012) systematic sampling procedure, where the multiple value was determined beforehand. Three open-ended questions were asked under the theme of students’ ability in decoding and comprehension tests and overall perception of their reading ability.

The intervention plan

Participants in the experimental group had undergone synthetic phonics teaching, with the use of the Jolly Phonics module (Lloyd & Wernham, 1992). Jolly Phonics accurately represents synthetic phonics teaching as it follows characteristics of this teaching as outlined by Blevins (2006) earlier. The intervention plan took 14 weeks, with 90 min teaching per session. The lesson started in Week 2, after the pretest, with an introduction to alphabetic knowledge and followed by teaching correspondent sounds, blending and segmenting, as well as exposure to reading and writing activities. The lessons were designed around the Jolly Phonics module (Lloyd & Wernham, 1992). There were seven workbooks with different phonemes taught in each book. Table 2 summarizes the phonemes covered in each workbook.

On the other hand, participants in the control group had received a “traditional” classroom teaching conducted by their own teacher. The lessons were designed based on the whole-language approach and followed the Curriculum Specification for English (Year 5), outlined by the MOEM (2003). In addition, repetition and reinforcement were implemented as part of the reading practices. The curriculum specification outlines that the learning content “…must be repeated often and used constantly to maximize learning” (MOEM, 2003, p. 3). Throughout the lessons, students in the control group were drilled with reading activities, ranging from reading words to sentences and paragraphs with guidance from the teacher.

Children in both groups were placed in different enclosed venues. The experimental group was placed in the school library to reduce interaction with other children. Both groups were closely supervised by the researchers during the study. In addition, students were unaware that this was an experiment as the tests were conducted as learning activities. Fidelity checks were also conducted, to include close supervision of the lessons taught in both groups to ensure that: (a) all lessons were covered according to the lesson plan, (b) teachers did not apply different reading methods in accordance to the assigned group, and (c) the lessons were engaging for students.

Similarly, in the final week (Week 14), both groups were assessed again in a posttest. A semi-structured interview was also conducted on eight randomly selected students from each group.

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Table 2. Summary of sounds/phonemes covered in each workbook.

<table>
<thead>
<tr>
<th>Workbook</th>
<th>Sounds/phonemes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>s, a, t, i, p, n</td>
</tr>
<tr>
<td>2</td>
<td>c, k, e, h, r, m, d</td>
</tr>
<tr>
<td>3</td>
<td>g, o, u, l, f, b</td>
</tr>
<tr>
<td>4</td>
<td>ai, j, oa, ie, ee, or</td>
</tr>
<tr>
<td>5</td>
<td>z, w, ng, v, oo, oo</td>
</tr>
<tr>
<td>6</td>
<td>y, x, ch, sh, th, th</td>
</tr>
<tr>
<td>7</td>
<td>qu, ou, oi, ue, er, ar</td>
</tr>
</tbody>
</table>
Results

Children in both groups had almost identical early reading ability at the beginning of this study. In the initial stage, the normal probability plots were examined to check the normality of the residuals. In the probability-probability plot (P-P), there was no indication that this assumption had been violated. The P-P plot is the graph of empirical cumulative density function (CDF) values plotted against the theoretical CDF values. It can be used to determine how well the data fit the theoretical distribution. Additionally, the Shapiro-Wilk test was conducted to test the normality of the distribution. The results indicate that the p value is insignificant (0.353) and the data were normally distributed. Table 3 further reports the findings of students in the pretest.

The Independent-Samples t test indicated that both groups did not significantly differ in their initial reading ability, where t(78) = 1.060, p > .1465. Both groups started with low reading ability, indicating that the students were struggling readers.

Decoding skills

The analysis in this section is executed based on the results of the pretest and posttest in decoding. The result of the paired-samples t test (Table 4) reveals that the achievement of the experimental group in the posttest ($M = 125.05$, $SD = 8.782$) is significantly higher than in the pretest ($M = 73.12$, $SD = 8.131$), where t(39) = 31.441, $p < .00005$. Similarly, the control group achieved a significant improvement in posttest ($M = 87.55$, $SD = 7.257$) compared to pretest ($M = 71.20$, $SD = 9.196$), with t(39) = 20.680, $p < .00005$. Nevertheless, the mean difference of the experimental group ($M = 51.93$, $SD = 0.651$) is substantial compared to the control group ($M = 16.35$, $SD = 1.939$).

Comprehension skills

The effects of synthetic phonics teaching on comprehension skills was analyzed based on results of pretest and posttest. From the paired sample t-test analysis as illustrated in Table 5, the results suggest that the achievement of the experimental group in the posttest ($M = 3.47$, $SD = 1.132$) was significantly higher than in the pretest ($M = 0.55$, $SD = 0.783$), where t(39) = 15.322, $p < .00005$. Similarly, the achievement of the control group in the posttest ($M = 0.93$, $SD = 0.997$) was

Table 3. Summary of independent-samples t test for both groups on early reading skills in pretest.

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Mean difference</th>
<th>n</th>
<th>95% CI of the Difference</th>
<th>p</th>
<th>t</th>
<th>df</th>
</tr>
</thead>
<tbody>
<tr>
<td>Early reading skills in pretest</td>
<td>2.275</td>
<td>80</td>
<td>-1.999, 6.550</td>
<td>0.1465</td>
<td>1.060</td>
<td>78</td>
</tr>
</tbody>
</table>

*p < .05.

Table 4. Summary of paired-samples t test for both groups in decoding for pretest and posttest.

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Pretest $M$</th>
<th>SD</th>
<th>Posttest $M$</th>
<th>SD</th>
<th>Mean Difference</th>
<th>n</th>
<th>95% CI of the Difference</th>
<th>p</th>
<th>t</th>
<th>df</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>71.20</td>
<td>9.196</td>
<td>87.55</td>
<td>7.257</td>
<td>16.35</td>
<td>40</td>
<td>14.751, 17.949</td>
<td>0.00005</td>
<td>20.68</td>
<td>39</td>
</tr>
<tr>
<td>Experiment</td>
<td>73.12</td>
<td>8.131</td>
<td>125.05</td>
<td>8.782</td>
<td>51.93</td>
<td>40</td>
<td>48.585, 55.265</td>
<td>0.00005</td>
<td>31.441</td>
<td>39</td>
</tr>
</tbody>
</table>

*p < .05.

Table 5. Summary of paired-samples t test for both groups in comprehension for pretest and posttest.

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Pretest $M$</th>
<th>SD</th>
<th>Posttest $M$</th>
<th>SD</th>
<th>n</th>
<th>95% CI of the Difference</th>
<th>p</th>
<th>t</th>
<th>df</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>0.40</td>
<td>0.709</td>
<td>0.93</td>
<td>0.997</td>
<td>40</td>
<td>0.363, 0.687</td>
<td>0.00005</td>
<td>6.565</td>
<td>39</td>
</tr>
<tr>
<td>Experiment</td>
<td>0.55</td>
<td>0.783</td>
<td>3.47</td>
<td>1.132</td>
<td>40</td>
<td>2.539, 3.311</td>
<td>0.00005</td>
<td>15.332</td>
<td>39</td>
</tr>
</tbody>
</table>

*p < .05.
significantly higher than in the pretest ($M = 0.4$, $SD = 0.709$), where $t(39) = 6.565$, $p < .00005$. However, the mean comparison for both groups suggests that the experimental group had a higher achievement level in posttest ($M = 3.47$, $SD = 1.132$) compared to the control group ($M = 0.93$, $SD = 0.997$).

Based on these results, we may draw two conclusions: First, both groups exemplified a significant improvement in posttest, and second, the experimental group displayed a striking improvement in posttest with the difference in mean ($M = 2.54$) and standard deviation ($SD = 0.135$) in comparison to the control group.

The above findings suggest a significant improvement on comprehension skills after receiving synthetic phonics teaching, where $t(39) = 15.322$, $p < .00005$. The data provide adequate evidence to summarize that synthetic phonics teaching was effective in improving comprehension skills after intervention was given to the experimental group. Therefore, the null hypothesis is rejected.

### Early reading skills

The results of the independent-samples $t$ test as illustrated in Table 6 reveal that in the beginning (pretest), students’ performance in early reading skills was not significantly different between both groups, where $t(78) = 1.060$, $p > .1465$. However, there was a significant difference between both groups in the posttest, witnessed in the posttest for the experimental group, where $t(78) = 31.010$, $p < .00005$. It is apparent that the overall achievement in early reading skills of the experimental group was higher ($M = 128.525$, $SD = 9.545$) compared to the control group ($M = 76.175$, $SD = 4.776$) in the posttest. The $t$ test has been tested for equality of variances using Levene’s test. If the Levene test is significant, the reported $t$ values are based on unequal variance assumptions. In this case, the Levene test is significant ($p = 0.002$), as the variances for the control and the experimental groups are unequal (Meier, Brudney, & Bohte, 2009). The findings also indicate that there was a significant difference in the achievement of the posttest between both groups, where $t(78) = 20.401$, $p < .00005$. Thus, synthetic phonics teaching was effective in developing the early reading skills of students in the experimental group. The absolute value of Cohen’s $d$ is 4.899, indicating large effect sizes. Cohen (1988) defined $d$ as the standardized difference between two group means. The effect sizes are categorized as “small” if $d = 0.2$, “medium” if $d = 0.5$, and “large” if $d = 0.8$. To account for unequal sample size and unequal variance between the two groups, the formula used to calculate Cohen’s $d$ is as follows: $d = \frac{X_1 - X_2}{\sqrt{\frac{SD_1^2}{n_1} + \frac{SD_2^2}{n_2}}}$.

The numerator is the mean difference between the two groups, whereas the denominator is defined as the square root of weighted pooled variance.

The semi-structured interview further supports these findings. In the experimental group, all eight selected respondents indicated they mainly employed a similar decoding strategy for reading the text independently and fluently, which was using sounding and blending (Blevins, 2006; Davis, 2012). Respondent 1 stated “I sound out the words, one by one. I sound out according to the letter. It’s one-to-one: One letter, one sound. Then I combine the sounds, beginning and ending.” Respondent 2 said, “Look at the letter. Recall the sounds. Then, add on all the sounds. The

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Control</th>
<th>Experimental</th>
<th>Mean difference</th>
<th>$n$</th>
<th>95% CI of the Difference</th>
<th>$p$</th>
<th>$t$</th>
<th>$df$</th>
<th>Cohen’s $d$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Early reading skills in pretest</td>
<td>65.2</td>
<td>10.246</td>
<td>67.475</td>
<td>8.913</td>
<td>2.275</td>
<td>80</td>
<td>-1.999, 6.550</td>
<td>0.1465</td>
<td>1.060</td>
</tr>
<tr>
<td>Early reading skills in posttest</td>
<td>76.175</td>
<td>4.776</td>
<td>128.525</td>
<td>9.559</td>
<td>52.350</td>
<td>80</td>
<td>48.989, 55.712</td>
<td>0.00005</td>
<td>31.010</td>
</tr>
</tbody>
</table>

*p < 0.05.*
beginning, middle, and end sounds. And then, I can read.” Interestingly, Respondent 4 explained using action phonemes: “Sound them with actions. Like we did in class. The sounds and actions are like I did. The movements: Combine the beginning and the end sounds.” In addition, Respondent 5 reflected on the blending practices: “Sound them quickly. And combine it.”

In the control group, the selected respondents (eight subjects) expressed that they employed different strategies to decode the words. Interestingly, Respondents 2, 3, 4, 5, 7, and 8 applied a similar approach in reading L1, the Malay language, to L2, English (Geva, 2006; Zainal, 2003). For instance, Respondent 2 said, “Just trial-and-error. Just do it. It’s similar to reading in the Malay Language.” Respondent 3 also stated, “Just read, like with the Malay Language. Sometimes it’s incorrect.” Respondent 4 mentioned that he “Read, as in normal reading: follow the Malay Language sounds and read.” Respondent 5 claimed that she “followed Malay Language sounds and read as usual.” Two respondents tackled the word decoding differently, using cognitive strategies such as recalling from memory (LaBerge & Samuels, 1974; Zainal, 2003). Respondent 1 tried to recall what had been taught in class: “I try to remember what I have learnt. I try to recall what my teacher taught. If not, I consider I don’t know it.” Respondent 6 tackled the reading of unfamiliar words by guessing the sounds, and comparing with other similar sounding words: “There’s similarity to some words I have seen. And the sounds are similar.”

The findings indicate that children in the experimental group had a structured strategy as sounding and blending the phonemes was used in decoding the text (Blevins, 2006; Davis, 2012). On the contrary, children in the control group employed different strategies, such as trial-and-error, memorization, and employing L1 strategies for reading. In conclusion, children who received synthetic phonics instruction seemed to have a more structured decoding strategy and read more fluently compared to those in the control group.

Discussion and conclusion

The synthetic phonics instruction was given to the experimental group and included early reading skills: the mechanics or decoding skills and comprehension skills (Lonigan et al., 2013). When compared to the control group, which received normal classroom instruction or whole-language approach, it was found that children in the experimental group achieved significantly higher scores in all the subtests for decoding. Second, there was an obvious difference in scores for individual phonemes and sound-to-letter (segmenting) test. This could be due to the synthetic phonics instruction for the experimental group that exposed the children to basic phonological knowledge, the foundation to decoding skills (LaBerge & Samuels, 1974; Zainal, 2003). These findings may be used to establish the synthetic phonics approach to improve phonographic knowledge in L2 learners as they are in line with other studies in rural Malaysian schools (Su & Hawkins, 2013). As a result, children in the experimental group had easily achieved and exemplified a mastery of phonemic awareness skills (Bentin, 1992; Treiman, 1992).

As the subjects in the experimental group had shown an improvement in reading ability and had improved in all the phonological awareness skills, it indicates that reading disabilities in L2 can be improved. The findings from the interviews seem to suggest that difficulties in decoding the text could be easily overcome by having phonological awareness (Bentin 1992; Koda, 1994; Treiman, 1992). On the contrary, the control group had a strategy imbalance and applied L1 reading strategies to solve difficulties in decoding in English (Blevins, 2006).

There was a significant difference in the increase in scores for both groups in the comprehension test, with the experimental group achieving a much higher mean than the control group. This may indicate that synthetic phonics instruction promotes comprehension skills. Although researchers seem to agree that synthetic phonics instruction has only a minimal impact on comprehension skills as it focuses on the development of decoding skills (Johnston & Watson, 2004; Stannard, 2006), the findings of this study seem to indicate that there is a potential for improvement of comprehension skills. This may be due to the implementation of synthetic phonics with the Jolly
Phonics module (Lloyd & Wernham, 1992), which exposes students to a fair amount of vocabulary and short stories. In support, children taught by this approach are being exposed to abundant vocabulary, word reading skills, and oral language, which has been proven to be a unique contribution to reading success as their background knowledge and meaning allocation is improved (LaBerge & Samuels, 1974; Vadasy & Sanders, 2011).

Another important issue that emerged from the findings in the semi-structured interview was the effect of L1 on reading in English, the concerns that the structural differences of L1 had an effect on L2 reading. The interviews exemplified that L1 impeded the reading comprehension performance in two of the respondents in the control group as they felt it was difficult to comprehend the text. This was due to the different language structures in L1 and L2 (Awal et al., 2007). In addition, poor performance in decoding tests affected the performance of the comprehension test as the attachment of meaning should have been done when decoding text (LaBerge & Samuels, 1974).

As discussed earlier, reading difficulties are described in terms of poor mastery in decoding and comprehension skills (Lesaux, 2012; Lonigan et al., 2013). The nature of synthetic phonics instruction appeared to improve children’s mastery in both domains. The instructional intervention in this study focused on alphabetic knowledge, its correspondent sounds, blending and segmenting words (Blevins, 2006), and reading for meaning practices (Davis, 2012). Though the children in both the control and experimental groups started with almost identical knowledge and ability in reading, the findings suggest that the experimental group outperformed its counterpart.

The results in the current study are consistent with the findings of past studies by Dixon et al. (2011), Su and Hawkins’s (2013) and the meta-analysis by Ehri, Nunes, Stahl, and Willow (2001). These studies similarly found synthetic phonics to be effective in developing early reading skills across different language backgrounds and settings, and it seems apparent that children who have acquired both decoding and comprehension skills were able to read effectively (Coady, 1979; LaBerge & Samuels, 1974). The children in the control group had performed poorly in decoding, and thus, this affected their performance in comprehension tests. On the contrary, children in the experimental group had acquired early reading skills as they exemplified an excellent performance in decoding. Despite the remarkable improvement, both groups showed no significantly different performance in name writing (t(78) = 1.00, p > .166) and rhyme awareness (t(78) = 2.28, p > .125). Name writing was tested because it is a written form of the children’s first attempt to convey meaning (Welsch et al., 2003). It reflects basic alphabetic principles, and thus, the generic concept and understanding of the written language are transferable from native to second language (Bialystok, 1997). Additionally, background knowledge is another contributing factor to this condition (LaBerge & Samuels, 1974). On the other hand, rhyme awareness is developed through basic listening skills (Yeung, 2008). It is also asserted that this skill is achievable even by exposing students to whole-language teaching, as it is “more alike as awareness of syllable and rhyming can be acquired naturally” (Yeung, 2008, p. 31). In addition, children in the control group were exposed to whole-language teaching, which similarly emphasized phonological knowledge through self-exploration (Hempenstall, 1996). Thus, this explains the insignificant difference in the rhyming awareness test.

The study investigated the effects of synthetic phonics on both decoding and comprehension skills, which are the core components of early reading development. The findings manifested its effectiveness and, thus, proved to be beneficial for struggling young ESL readers in non-native language settings. These children started with an almost identical set of skills in English reading, but the experimental group had shown an extensive improvement at the end of the study. However, two subskills were found to be not significantly different: name-writing and rhyme-awareness. As mentioned earlier, these skills were exposed in both teaching approaches, either synthetic phonics or normal teaching (whole-language).

There are several limitations in this study. First, it did not explore the cross-language transfer when learning to read in L2. Second, the L1 was a dialect of the state of Kelantan, which may be
structurally different from standard Malay language and may affect language learning in standard Malay language and, thus, interfere with L2. Future studies could be done to further investigate the effects of cross-language transfer and the effects of the local dialects on reading in L2. Lastly, these findings cannot be generalized to the Malaysian population as the study was conducted on a selected group in a rural school of the Gua Musang district in the state of Kelantan. Hence, similar studies with a larger sample can be done to determine the effectiveness of synthetic phonics instruction for the larger population in rural schools in Malaysia.

Disclosure statement

No potential conflict of interest was reported by the author(s).

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