Phonics training and English word reading ability in Hong Kong primary students

Ho Sin Ting, Anne

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Abstract

This study investigated the effect of phonics training towards the English word reading ability and grapheme-phoneme correspondence (GPC) development of 75 primary students from P2 and P5 who received / not received phonics training by non-word reading task and real-word reading task. The results showed that the effect of phonics training on non-word and real-word reading was demonstrated. It was shown that the traditional "look and say" teaching method was not sufficient to provide development of grapheme-phoneme correspondence or help develop adequate reading skills. By explicit and systematic method of phonics training, learners would acquire a stronger awareness of letter to sound conversion. Thus, phonics training was suggested to promote in local primary education.

Introduction

The relationship between phonological awareness and learning to read has always interested researchers. Phonological awareness is a kind of metalinguistic ability which refers to the understanding that spoken words can be broken down to smaller unites of sound segments including syllable, onsets, rimes, or phonemes (Goswami & Bryant, 1990; Gillon, 2004). The awareness and understanding of the linguistic structures between written and spoken language can be established through training in the letter to sound correspondences (Siok & Fletcher, 2001). Phonics refers to "the learning of letter-sound correspondences for reading and spelling" (Gillon, Pp.11). Therefore, it is believed that phonics training would enhance the development of phonological awareness. Learning alphabetical language was found to facilitate the acquisition and use of grapheme-phoneme conversion rules (GPC rules), it is because letters roughly correspond to the phoneme, which promote the awareness of relationship between GPC rules, by learning such letter-to-sound relationship, phonological recoding will be facilitated in phonemic level (Cheung, 1999).

Comparison between phonics-trained subjects and non-phonics-trained subjects were done before to investigate the contribution of acquiring GPC rules to alphabetical first language (L1) comprehension. Mann & Wimmer (2002) compared the phonemic awareness skills of American (phonics-trained) and German (non-phonics trained) kindergarteners, the phonics group did significantly better than the non-phonics counterparts on phonemic awareness task, including phoneme awareness measures and phoneme deletion. This study

demonstrated the importance of grapheme-phonemes correspondence to phonological awareness at phonemic level. However, direct comparison of their reading performance did not carry out since the German kindergarteners are pre-readers. Connelly, Johnston, and Thompson (2001) studied the effects of phonics instruction on reading comprehension of beginning readers; English L1 participants from Scotland (phonics) and New Zealand (non-phonics) with comparable education background were recruited to complete a number of tasks. The results have shown that the phonics group was superior to their non-phonics counterparts in non-word reading, regular real-word reading and phonemic awareness. From this, phonics training was suggested to promote English word reading ability in English L1 community.

Bilingual speakers are more and more common in the world's population. Previous researches have demonstrated cross-language phonological transfer from L1 to L2 in alphabetical language (Cisero & Royer, 1995; Comeau, Cormier, Grandmaison, & Lacroix, 1999). In Hong Kong, many people are bilingual in L1 Cantonese (non-alphabetical) and L2 English (alphabetical). Therefore, it is interesting to know about the possible cross-language phonological transfer from non-alphabetical L1 to alphabetical L2 during the L2 language acquisition. Chinese is a logographic writing system that each Chinese character was associated with a syllable and represented a lexical morpheme (Huang &Hanley, 1994; Cheung, 1999). Over 80% of the characters are compound characters which contain a phonetic and semantic component, the phonetic radical of the character often

suggest the actual pronunciation of the character or analogy cues in terms of similar sounding characters according to the character's family regularity and consistency (Cheung; Gottardo, Yan, Siegel, & Wolley, 2001). Such orthographic-phonological correspondences of Chinese characters only provided phonetic information at syllabic level but not in phonemic level (Gottardo et.al). Studies providing evidence of a certain level of phonological transfer show that bilingual reading acquisition is a joint function involving the same phonological and orthographical skills in phonological awareness tasks. (Gottardo, Yan, Siegel, & Wolley, 2001; Wang, Perfetti, & Liu, 2005). For example, the Chinese onset matching skills was significantly correlated to English onset and rime matching skills (Wang, Perfetti, & Liu, 2005). However, at phonemic level, the situation is questioned due to the lack of grapheme-phoneme correspondence provided in Chinese. A longitudinal study (Lesaux & Siegel, 2003) examined the development of reading in kindergarten children who speak English as a second language with participants from immigrants of Canada including L1 Cantonese speakers who received phonological awareness instruction in kindergarten and phonics instruction in Grade 1. The results showed that, by grade 2, most ESL cases caught up in the reading performance of the native speakers (Lesaux & Siegel). This finding supported that the successful acquisition of GPC knowledge enhance English reading ability even in ESL population.

Historically, "look and say" instruction was applied to Hong Kong English teaching which Hong Kong students learned to read English without explicit phonic instruction (Holm

& Dodd, 1996; Jackson et.al., 1999). Under this method, teachers would show students a word, name it, and ask the students to repeat the name; limited attention was given to letter sounds or letter names within a word (McBride-Chang & Treiman, 2003). Therefore, no letter-to-sound knowledge was able to transfer to English (L2) as the second language. Jackson et. al. (1999) suggested that Hong Kong participants learned to read English in ways that might not have stressed grapheme-phoneme correspondences (GPC). This teaching instruction is unique in Hong Kong since the students in People's Republic of China (PRC) and Taiwan learn to read Chinese (L1) with the aid of pinyin and zhuyin fuhao respectively, which provided phonological cue to read Chinese. Therefore, the special situation in Hong Kong interested many researchers and studies have shown a strong relationship between phonological awareness and word reading in both English and Chinese (Holm & Dodd, 1996; McBride-Chang & Kail, 2002).

McBride-Chang & Kail, (2002) measured factors to predict reading acquisition including phonological awareness, speeded naming, visual spatial skills, and processing speed in kindergarten students in Hong Kong and United States; they attributed the phonological awareness to reading acquisition in both English and Chinese reading skills. Holm & Dodd (1996) studied the effect of L1 on the acquisition of English (L2) by comparing university students from PRC, Hong Kong, Vietnam and Australia. The results highlighted the poor phonological awareness of Hong Kong students and they performed significantly poor in non-word reading task. The authors explained the situation was due to the lack of exposure

to alphabetic system in the acquisition of L1 and therefore it was suggested that if Hong Kong subjects were taught an alphabetic system in an analytic way, better phonological awareness would be resulted (Holm & Dodd). As early ESL learners, how will Hong Kong students perform in English reading under different instruction methods, with phonics or traditional "look & say" strategies? It is reasonable to hypothesize that if Hong Kong students receive phonics training, which letter-to-sound rules were introduced in an analytic way, their phonological awareness at phonemic level would be enhanced thus there will be better performance on non-word reading when compared with the non-phonics peers.

Previous researches were done to investigate the effects of phonetic training on phonological awareness and reading ability at kindergarten, college, and university level. (Holm & Dodd, 1996; Lesaux & Siegel, 2003; Choy, 2003) However, few have investigated at primary level. In recent years, phonics teaching has become more and more popular in Hong Kong early education. Some primary schools have started to implement the phonics approach in the English teaching. The phonic approach focused on instruction of how the sounds of speech are represented by letters and spellings through the awareness of the phonemic composition of words (Snow, Burns, & Griffin, 1988). In the present study, direct comparison was done between non-phonics and phonics group in primary school, who received "look and say approach" and "phonics approach" training respectively. The Study was carried out to investigate their differences in GPC rule application and English reading ability. From this direct comparison, a clearer way of future English teaching approach

could be illustrated. The results highlighted the importance of phonics training for the English teaching in Hong Kong.

The present study was designed to investigate the knowledge of GPC rule on reading ability of Hong Kong primary students. Two grades of primary students (P.2 and P.5) participated in the study to represent the lower and upper primary levels and to demonstrate any possible developmental pattern of GPC and reading ability in a cross-sectional perspective. The following research questions would be answered in this study:

1. Were there any differences in GPC rule application as reflected in non-word reading among Hong Kong primary students with different phonics skills?
2. Would phonics training affect English real-word reading ability?
3. By comparing the phonics group and non-phonics group of different grades, were there any developmental GPC knowledge and the reading ability?

2. Method

2.1. Participants

Seventy-five Cantonese-speaking primary students participated in this study. Participants were recruited from primary schools in Hong Kong with the consent from school principals. All participants were within the normal range of non-verbal IQ to make the groups comparable. They formed into four groups on the basis of their grade (Primary 2 and Primary 5) and the phonics training they received. There were 20 students in P2 non-phonics group, P5 phonics group, and P5 non-phonics group while there were 15

students in the P2 phonics group.

2.2 Participant selection process

Screening tests were carried out to ensure the participants meet the criteria.

2.2.1 Phonics knowledge screening

Phonics checklist from Duncan & Parkhouse (2001) was selected as stimuli. (Appendix 1) Phonemes and graphemes, initial consonant clusters / digraphs, common end clusters and word endings are included in the checklist. All participants were tested individually in a quiet room and they were required to read aloud the phonic symbols. The students would be grouped into phonics group if they received phonics training before and scored 70% or above in the phonics checklist; they would be grouped into non-phonics group if they have no exposure to any phonetics/phonics training and scored 30% or below in the phonics checklist. For those who scored between 31% and 69% would be screened out.

2.2.2 Raven's Progressive Matrices (RMP)

All participants were required to complete the Raven's Progressive Matrice (RMP) in a quiet room. The raw score obtained was compared with the Hong Kong Supplement to Guide to the Standard Progressive Matrices. Only participants with Standard score between 80 and 130 were selected to participate in this study.

2.3 Tasks

2.3.1 Non-word reading

The Word Attack subtest of the Woodcock Reading Mastery Test – Revised (Woodcock,

1988) was selected as the non-word reading test. The test consisted of two alternate test forms, G-form and H-form. The first thirty-five test items in G-form (Appendix 2) were selected as stimuli which were from 2 to 7 letters with 1 to 2 syllables. The student was shown one item at a time on an A4 size paper and was instructed to sound out the letter string aloud as best as he / she could. Thirty-five items were selected to meet the standard score of 110 for grade 5 level in USA. Therefore, ceiling effect could be avoided as the participants were P2 and P5 students in this study. Five examples from H-form were given before the introduction of the test items. The scoring was done in accordance with the method described in the Woodcock manual with IPA transcription, and then the raw score would be converted to standard score for analysis.

2.3.2 Real-word reading

The reading subtest of WRAT3: Wide Range Achievement Test (Wilkinson, 1993) were selected as the real-word reading test. The test consisted of two alternate test forms, Tan-form and Blue-form. The first twenty-five items from Tan Reading (Appendix 3) were selected as stimuli which were from 3 to 11 letters with 1 to 5 syllables. The students were shown one item at a time on an A4 size paper and were instructed to read the word aloud as best as he / she can. Twenty-five items were selected to meet the standard score of 110 for grade 5 level in USA. Therefore, ceiling effect could be avoided as the participants were P2 and P5 students in this study. Five examples from Blue Reading were given before the introduction of the test items. The scoring was done in accordance with the method

described in the WRAT3 manual with IPA transcription, and then the raw score would be converted to standard score for analysis.

2.4 Procedure

Consents from principals of the participating schools were obtained before the data collection. The screening session was administered in a quiet room in the participating primary school by a trained undergraduate student of Speech and Hearing Sciences. Participants first completed the Raven's Progressive Matrices; the students were required to complete the test and write the answers on the separated answer sheet. This is followed by the phonics screening test. All participants' oral reading was recorded by a MD recorder. The students were given a gift for participation at the end of the session.

Students who satisfied the criteria described earlier were invited to participate in the testing session in another day. The test session was administered in a quiet room in the participating primary school by a trained undergraduate student of Speech and Hearing Sciences. In the reading tasks, non-word stimuli were always presented before real word stimuli to avoid priming from the real words. Moreover, the participants read the stimuli in the same order so as to avoid potential priming effect in reading non-words with the same rhyming units. (e.g. dog, pog; cat, gat) The students were given a gift for participation at the end of the session.

3. Data Analysis

The data collected were transcribed and analyzed by an independent phonetically trained

person (undergraduate of speech and hearing sciences). The Scoring of the reading tests (real-word reading & non-word reading) was done and the raw score were converted to standard score according to the method described in the WART3 manual and WRMT-R manual respectively. By counting the number of the correct responses, raw scores were obtained from the reading tests. The raw score will then convert to standard score for comparison. The mean and the standard deviation of each group (P2 phonics, P2 non-phonics, P5 phonics, & P5 non-phonics) were calculated.

In order to answer the research question about the differences in non-word reading ability among Hong Kong primary students receiving different amount of phonics training, the effects of phonics training on English reading ability in Hong Kong primary students, and the presence of developmental GPC and reading ability, two-way ANOVA with repeated measures and post-hoc Tukey analysis was done with independent variables of grade and phonics-training to analyze the data and to compare each grade's and overall performance in non-word /word reading task in terms of standard score. Qualitative analysis was done on the transcribed results and the reading pattern of each group was analyzed by clinician. Error pattern of reading non-word and real word between the phonics and non-phonics group was analyzed by calculating the percentage of real-word / non-word substitution, types of error in each syllable position (onset, nucleus, and coda), and the percentage of the features (not) retained in each position.

Results

4.1 Non-word reading

In order to investigate whether the groups of subjects, P2 and P5, phonics trained and non-phonics trained participants performed differently in the non-word reading test, a two-way ANOVA with repeated measures was used to compare each group's performance by using standard score. The means and standard deviations of the subject groups are shown in Table 1. The main effect of grade was not significant ($F = 1.92$, $p = 0.17$) while there was a main effect of phonics training (F (1, 71) = 123.66, $p \leq 0.05$). The inter-rater reliability of phonetic transcriptions between the data collector and the researcher was 96%.

The interaction of grade and phonics training was statistically significant (F (1, 71) = 6.48, $p \leq 0.05$). A Tukey post-hoc analysis was carried out to further investigate the group differences and the group difference was shown in Table 1. It was confirmed statistically by Tukey procedure, both phonics group from P2 and P5 are statistically different from the other three groups, which indicated the contribution of phonics training in non-word reading across the grade. No statistical significant differences were observed between P5 and P2 non-phonics groups while the difference between P5 and P2 phonics group was statistically significant.

Table 1
The groups' performance on non-word reading task

			Post hoc (Tukey)			
	Mean	SD	P5 Phonics	P5 Non-phonics	P2 Phonics	P2 Non-phonics
P5 Phonics	86.35	4.308		*	*	*
P5 Non-phonics	71.55	9.698	*		*	
P2 Phonics	93.13	7.029	*	*		*

P2 Non-phonics	69.55	7.515	*	*

* Denotes pairs of groups significantly different at 0.05 level.

Qualitative analysis of the four groups' error pattern in non-word conditions was carried out. For the incorrectly read non-words, it was analyzed as "real-word substituting for non-word" (e.g. fay /feɪ/ → flower [flauə]; /tadding /tædɪŋ/ → lion [laɪən]) or "non-word response" (e.g. fay /feɪ/ → [fa]; tadding /tædɪŋ/ → [tændɪŋ]). Table 2 shows the percentage of error using "real word substitute non-word" among the four groups. From the percentage of error, it is clear that the non-phonics groups are more dependent on using real-word to substitute for non-word in the non-word reading task.

Table 2
Percentage of error by using real-word substitute non-word

	P5 Phonics	P5 Non-Phonics	P2 Phonics	P2 Non-Phonics
Percentage of error	0.9%	21.1%	4.0%	34.9%

Errors of non-word substitute non-word responses were further analyzed by each syllable (onset, nucleus, and coda), with the corresponding error pattern (substitution, deletion, and insertion). Table 3 illustrated the types of error in each syllable with the percentage of types of error. Nucleus substitution was the most common types of error in P5 phonics, P5 non-phonics, and P2 phonics group; while the second highest type of error in P2 non-phonics group. The results have shown that participant face the difficulty of processing vowels no matter they have received phonics training or not. The highest percentage in coda deletion of P2 non-phonics group (23.2%) can be explained as the participants were only able to read the non-word with CV structure (e.g. bim /bɪm/ → [ma], with onset substitution, nucleus substitution, and coda deletion).

Table 3

Percentage of error in each types of error of non-word substitute non-word reading

	P5 Phonics Group			**P5 Non-phonics Group**		
	Onset	Nucleus	Coda	Onset	Nucleus	Coda
Substitution	10.0%	31.5%	10.0%	8.3%	28.8%	9.9%
Deletion	4.6%	11.2%	6.2%	9.0%	10.6%	13.5%
Insertion	7.1%	7.9%	11.6%	4.2%	2.6%	13.1%
	P2 Phonics Group			**P2 Non-phonics Group**		
	Onset	Nucleus	Coda	Onset	Nucleus	Coda
Substitution	10.9%	42.5%	5.4%	14.5%	20.3%	4.2%
Deletion	7.2%	7.7%	12.7%	11.9%	12.1%	23.2%
Insertion	1.8%	5.0%	11.3%	2.6%	1.6%	9.5%

The analysis of substitution error in onset, nucleus, and coda on whether the erroneous sound could be retained in features of the original phoneme was carried out. For onset and coda, the percentage of retaining place and manner features was calculated; for nucleus, the percentage of retaining front-back (FB), roundedness (R), and high-low (HL) was calculated.

For the errors in onset, the highest percentage of the participants from P5 non-phonics group, P2 phonics group, and P2 non-phonics group were unable to retain both place and manner of articulation (e.g. tadding /tædɪŋ/ → [hadɪ], the alveolar plosive was substituted by glottal fricative). P5 phonics group was more able to retain manner but not place feature (e.g. shab /ʃab/→ [sab]). The detail results were shown in Table 4 below:

Table 4

Percentage of the features (not) retained in onset of the non-word reading task

Features that were (not) retained	P5 Phonics	P5 Non-Phonics	P2 Phonics	P2 Non-Phonics
+place, -manner	25%	26.9%	33.3%	14.5%
-place, +manner	45.8%	23.1%	25%	29.1%
-place, -manner	29.2%	50%	41.7%	56.4%

"+" indicates features retained in erroneous phoneme.

"-" indicates features not retained in erroneous phoneme.

For the errors in nucleus, subjects from all group shown the greatest ability to retain the roundedness of the vowel but not the front-back and high-low feature (e.g. raff /ra:f/ → [rɪf], the back, low, and unrounded vowel was substituted by front, high, and unrounded vowel). The results of the features that were (not) retained was shown as above in Table 5.

Table 5
Percentage of the features (not) retained in nucleus of the non-word reading task

Features that were (not) retained	P5 Phonics	P5 Non-Phonics	P2 Phonics	P2 Non-Phonics
-FB, +R, -HL	40.8%	37.7%	40.4%	51.9%
-FB, -R, -HL	23.7%	34.4%	20.2%	19.5%
+FB, +R, -HL	25%	18.9%	2.1%	6.5%
-FB, +R, +HL	3.9%	1.1%	21.3%	1.3%
+FB, -R, -HL	5.3%	4.4%	7.4%	14.3%
-FB, -R, +HL	1.3%	1.1%	4.3%	6.5%
+FB,-R, +HL	0%	2.2%	4.3%	0%

"+" indicates features retained in erroneous phoneme.
"-" indicates features not retained in erroneous phoneme.

For the errors in coda, substitution error was not the major type of error as shown in table 3. The patterns among the four groups are different. P5 phonics group was more able to retain place but not manner (e.g. bim /bɪm/ → [bɪp], bilabial nasal substituted by bilabial plosive.) P5 non-phonics group got the same percentage in retaining place but not manner (e.g. chad /ʧæd/ → [ʧæn], alveolar plosive substituted by alveolar nasal), and not retaining both place and manner (e.g. chad /ʧæd/ → [kæm], alveolar plosive substituted by bilabial nasal). P2 phonics group was more able to retain manner but not place (e.g. pog /pɔg/ → [pɪt], velar plosive was substituted by alveolar plosive). P2 non-phonics group was unable to retain both place and manner (e.g. raff /ra:f/ → [rɪd], labiodental fricative was

substituted by alveolar plosive). Table 6 showed the distribution of the error pattern of substitution of coda.

Table 6
Percentage of the (not) retained in coda of the non-word reading task

Features that were (not) retained	P5 Phonics	P5 Non-Phonics	P2 Phonics	P2 Non-Phonics
+place, -manner	41.7%	35.5%	29.2%	25%
-place, +manner	37.5%	29.0%	37.5%	25%
-place, -manner	20.8%	35.5%	33.3%	50%

"+" indicates features retained in erroneous phoneme.
"-" indicates features not retained in erroneous phoneme.

4.2 Real-word reading

The means and standard deviations of the subject groups are shown in Table 7. Results from two-way ANOVA with repeated measures showed a significant main effect of both grade (F (1, 71) = 19.432, $p \leq 0.05$) and phonics training (F (1, 71) = 13.013, $p \leq 0.05$). The inter-rater reliability of phonetic transcriptions between the data collector and the researcher was 98%. Therefore, in terms of standard score, the P2 students performed significantly better than the P5 students; while the phonics trained student performed significantly better than the non-phonics trained students.

The interaction of grade and phonics training was statistically insignificant (F = 0.411, p = 0.524). A Tukey post-hoc analysis was carried out to further investigate the group differences. Table 7 shows results of Tukey contrasts of the groups' performance. It was shown that only the P5 non-phonics group was significantly different from the other three groups. That means there were significant differences between the P5 phonics and

non-phonics group but absence of differences between P2 phonics and non-phonics group that were expected to be different. We will further discuss this phenomenon in the discussion part below.

Table 7
The groups' performance on real-word reading task

	Mean	SD	Post hoc (Tukey)			
			P5 Phonics	P5 Non-phonics	P2 Phonics	P2 Non-phonics
P5 Phonics	71.40	8.230		*		
P5 Non-phonics	61.85	6.418	*		*	*
P2 Phonics	79.87	16.839		*		
P2 Non-phonics	73.20	5.540		*		

* Denotes pairs of groups significantly different at 0.05 level.

The qualitative analysis process was the same as the non-word reading task. For the incorrectly read non-words, it was analyzed as "real-word substitute real-word" (e.g. litter /lɪtə/ → letter [letə]; rudimentary /rudɪmentərɪ/ → road [rəʊd]) or "non-word substitute real-word" (e.g. stalk /stɔ:k/ → [stɪk]). Table 8 shows the percentage of error using "real-word substitute real-word" among the four groups. Consistent with the findings in the non-word reading task, the non-phonics group produced more real-word response in the real-word reading test. The percentage of real-word substitution in the phonics group recorded a higher percentage in the real-word reading task than in the non-word reading task mainly for the P5 phonics group.

Table 8
Percentage of error by using real-word substitute real-word

	P5 Phonics	P5 Non-Phonics	P2 Phonics	P2 Non-Phonics
Percentage of error	5.6%	21.8%	5.6%	30.4%

The same as the non-word reading task, the types of error in each syllable with the

percentage types of error were analyzed and presented in the Table 9. Except the P2 non-phonics group, nucleus substitution (e.g. stalk /stɔ:k/ → [stɪk], back, mid-low and rounded vowel was substituted by front, high, and unrounded vowel) was the most common types of error while the P2 non-phonics group showed the highest percentage of error in onset deletion (21.9%) and nucleus deletion (21.4%) (e.g. city /sɪtɪ/ → [sɪ] onset and nucleus deletion in the second syllable). The result reflected their poor ability to segment the real-words to syllables which leads to whole syllable (onset + rime) deletion (e.g. residence /rezədəs/ → [rɪs], two syllable was deleted).

Table 9
Percentage of error in each types of error of non-word substitute real-word reading

	P5 Phonics Group			**P5 Non-phonics Group**		
	Onset	Nucleus	Coda	Onset	Nucleus	Coda
Substitution	7.9%	29.1%	3.9%	13.5%	25.3%	8.0%
Deletion	16.1%	18.1%	12.2%	14.9%	18.7%	9.7%
Insertion	2.8%	3.9%	5.9%	1.7%	1.4%	6.9%
	P2 Phonics Group			**P2 Non-phonics Group**		
	Onset	Nucleus	Coda	Onset	Nucleus	Coda
Substitution	8.6%	22.8%	8.3%	11.3%	17.5%	5.1%
Deletion	16.9%	21.5%	13.9%	21.9%	21.2%	17.1%
Insertion	1.0%	0.3%	6.6%	1.7%	0.7%	3.4%

For the response with substitution error, analysis on the ability to retain in features of the original phoneme was carried out in onset, nucleus, and coda respectively and the percentages of features (not) retained were calculated.

The percentage of features (not) retained in onset of the real word reading task was shown in Table 10. For P2 subjects, both phonics and non-phonics group were unable to retain both place and manner feature (e.g. city /sɪtɪ/ → [kætɪ], alveolar fricative is

substituted by velar plosive in the first syllable). P5 subjects demonstrated better ability to retain the place features. (e.g. humidity /hju:mɪdɪtɪ/ → [hju:mæntɪ], alveolar plosive is substituted by alveolar nasal in the third syllable.)

Table 10

Percentage of the features (not) retained in onset of the real-word reading task

Features that were (not) retained	P5 Phonics	P5 Non-Phonics	P2 Phonics	P2 Non-Phonics
+place, -manner	45.0%	41.0%	26.9%	18.2%
-place, +manner	15.0%	17.9%	7.7%	21.2%
-place, -manner	40.0%	41.0%	65.4%	60.6%

"+" indicates features retained in erroneous phoneme.

"-" indicates features not retained in erroneous phoneme.

The substitution errors in nucleus were analyzed and results were shown in Table 11 below. The highest percentage of the participants from P5 non-phonics group, P2 phonics and non-phonics group were unable to retain all features of the nucleus (e.g. stalk /stɔ:k/ → [stɪk], back, mid-low and rounded vowel was substituted by front, high, and unrounded vowel)). Among the features, all four groups of subject demonstrated the greatest ability to retain the roundedness of the vowel (e.g. cliff /klɪf/ → [kaf], front, high, unrounded vowel was substituted by back, low, unrounded vowel) followed by the front-back of the vowel. (e.g. cliff /klɪf/ → [klef], front, high, unrounded vowel was substituted by front, high-mid, unrounded vowel)

Table 11

Percentage of the features (not) retained in nucleus of the real-word reading task

Features that were (not) retained	P5 Phonics	P5 Non-Phonics	P2 Phonics	P2 Non-Phonics
-FB, +R, -HL	28.4%	24.7%	21.7%	31.4%
-FB, -R, -HL	24.3%	42.5%	34.8%	39.2%
+FB, +R, -HL	23.0%	13.7%	20.3%	11.8%

-FB, +R, +HL	0%	0%	2.9%	0%
+FB, -R, -HL	18.9%	12.3%	10.1%	13.7%
-FB, -R, +HL	4.1%	5.5%	7.2%	3.9%
+FB,-R, +HL	1.4%	1.4%	2.9%	0%

"+" indicates features retained in erroneous phoneme.
"-" indicates features not retained in erroneous phoneme.

Coda substitution was relatively rare to observe as shown in Table 12. The percentage of features (not) retained in coda of the non-word reading task is quite different among the groups. The highest percentage of the participants from P5 non-phonics group, P5 phonics group and P2 non-phonics group were unable to retain both place and manner features (e.g. rancid /rænsɪd/ → [ræg], alveolar nasal is substituted by velar plosive in the first syllable). P5 students were more able to retain place feature than manner features (e.g. rancid /rænsɪd/ → [rædsɪd], alveolar nasal is substituted by alveolar plosive in the first syllable). For P2 students, the phonics group is better in retaining the place feature with high percentage accuracy (e.g. stalk /stɔk/ → [stat], alveolar plosive is substituted by velar plosive). However, there was absence of clear pattern on the P2 non-phonics group.

Table 12
Percentage of the (not) retained in coda of the non-word reading task

Features that were (not) retained	P5 Phonics	P5 Non-Phonics	P2 Phonics	P2 Non-Phonics
+place, -manner	40.0%	34.8%	64.0%	26.7%
-place, +manner	20.0%	17.4%	16.0%	33.3%
-place, -manner	40.0%	47.8%	20.0%	40.0%

"+" indicates features retained in erroneous phoneme.
"-" indicates features not retained in erroneous phoneme.

In summary, our results showed main effect and interaction effect of phonics training in non-word reading task across grade. Nucleus substitution was the major error type among

the groups. In real-word reading task, main effect in both grade and phonics training showed that P2 students did significantly better than P5 students and the phonics trained students performed better than the non-phonics trained students. However, no interaction effect was observed, only P5 non-phonics group was significantly different from other groups. Nucleus substitution remained the major types of error while there was a significant number of deletion error observed in the real-word reading task.

5. Discussion

Seventy-five primary students were recruited to investigate the effect of phonics training on reading ability of Hong Kong primary students and several findings are reported. Firstly, based on the better performance of the phonics group, phonics trained students apply GPC rules better than the non-phonics trained students as reflected in the non-word reading task. The results showed that there was no grade effect but phonics training effect which can be explained by the sub-lexical route of non-word reading. Through phonics training, the phonics-trained participants developed a stronger grapheme-phoneme correspondence and they were more able to assess the non-word through the sub-lexical GPC rule. On the other hand, the non-phonics participants developed a weaker concept of grapheme-phoneme correspondence through the traditional "look & say" teaching method. That is, the non-phonics participants tended to use visually similar real-word to substitute the target stimuli (e.g. bufty /bʌftɪ/ →_butterfly [bʌtəflaɪ]). From the post-hoc analysis, it was indicated that there was lack of difference between the P2 and P5 non-phonics group. That

means, the P2 and P5 non-phonics group performed very similarly in the non-word reading task although the P5 non-phonics group had three years English exposure more than the P2 non-phonics group. This lack of grade difference showed that GPC rule is unable to develop through the exposure of English which will be further discussed below. It further proved the importance of phonics training towards the acquisition of grapheme-phoneme correspondence.

Secondly, phonics training contributed to real-word reading as showed in the main effect between the phonics and non-phonics group. However, only significant effect was shown in the P5 groups. The strategy of reading unfamiliar real-word was supposed to be the same as the strategy of reading non-word. Therefore, the phonics groups were more able to read the unfamiliar words by using the sub-lexical GPC route while the non-phonics group could not. In other word, phonics training would enhance the real-word reading ability and the ability to "learn to read". The insignificant results in P2 may be due to the nature of the stimuli of the read-word reading task. The stimuli of the real-word were from 3 to 11 letters with 1 to 5 syllables. No matter P2 students were phonics-trained or not, they were less able to segment the word into syllable. Thus, even the phonics trained P2 students could not apply GPC rules to read the real-words with multi-syllables. Significant differences between P5 phonics and non-phonics group was observed from the post-hoc analysis. For P5 students, they had three more years English learning experiences than the P2 students. Thus, they were more frequent to read multi-syllabic English words and segment the word into syllables. Through

phonics training, the P5 phonics participants were more able to apply the grapheme-phoneme correspondence in reading while the P5 non-phonics participants did not develop grapheme-phoneme correspondence through "look-and-say" English teaching method. Thus, the P5 phonics group performed significantly better than the P5 non-phonics group in the real-word reading test.

Thirdly, there was no developmental GPC knowledge observed by comparing P2 and P5 phonics group and P2 and P5 non-phonics group in the non-word reading task. In the phonics groups, P5 students obtained a lower standard score than the P2 students. For the real-word reading ability, there was also no developmental pattern observed by comparing the P2 and P5 phonics group, and P2 and P5 non-phonics group in the real-word reading task. The results showed that it is unlikely to develop GPC by exposure to English without explicit phonics training. However, due to the similar length of phonics training in both P2 and P5 phonics group, it is hard to conclude the developmental GPC knowledge in the phonics group. Interestingly, both the phonics and non-phonics groups, P5 students obtained a lower standard score than the P2 students. In this research, the raw scores obtained from the standardized test Woodcock Reading Mastery Test-Revised (non-word reading test) and WRAT3: Wide Range Achievement Test (real-word reading test) was converted to standard score according to the norm from USA. Due to a great English improvement between grade 2 and grade 5 in US students (alphabetical L1), it is plausible that a lower standard score obtained by the Hong Kong P5 students than the P2 students.

From the qualitative error analysis, there were some interesting observations. Real-word substitution significantly obtained a higher percentage in the non-phonics group in both non-word reading and real-reading task. Generally, students would find a familiar word with similar spelling of the target word, or preserve the first letter of the target word to substitute the target word (e.g. litter /lɪtə/ → letter [letə]; fay /feɪ/ → flower [flauə]). The possible strategy of real-word substitution is to borrow the reading strategy of L1, according to Holm & Dodd (1995), the whole word approach. The participants of this study are non-alphabetical L1 of Cantonese-English bilingual speakers, as discussed above, no GPC rule will be developed without explicit phonics training. Therefore, when the non-phonics groups face a word that they did not come across before, they were unable to use the GPC rule to read the word. Rather than using GPC, the students may substitute the target word with a visually similar real-word (e.g. bufty /bʌftɪ/ → butterfly [bʌtəflaɪ]). Particularly in the P2 non-phonics group, some students responded with a visually not similar real-word (e.g. tadding /tædɪŋ/ → lion [laɪən]). This reflected the difficulty to generate a visually similar real-word.

Nucleus substitution was the major error type among the groups in both non-word and real-word reading task. Also, we found that it is not easy for student to retain the features, especially front-back and high-low feature in the error production. This phenomenon could be explained by the grapheme formation of vowels in English. The English letter “a”, “e”, “i”, “o”, “u” were the basic units of the formation of vowels. These five letters combine and

form short vowels (/ɪ/, /e/, /æ/, /ɒ/, /ʌ/, /ʊ/, /ə/), long vowels (/i:/, /ɑ:/, /ɔ:/, /u:/, /ɜ:/), and diphthongs (/eɪ/, /aɪ/, /ɔɪ/, /əʊ/, /aʊ/, /ɪə/, /eə/, /ʊə/). Due to the limited regularity of grapheme-phoneme correspondence of vowels, students are less likely to pronounce the nucleus of a word correctly and this explained the low percentage of retaining features of the nucleus. Compare with consonants, 21 letters ("a" to "z", except "a", "e", "i", "o", "u") represented 25 different consonant in English, the higher regularity lowered the substitution error. Therefore, it was observed a significant high percentage of nucleus substitution error among the error patterns. Among the retained feature of the nucleus substitution, roundedness was more resistant to substitution. Nucleus substitution error with retained roundedness was more frequent to observe (e.g. weat /wi:t/ (front, high, unrounded vowel) was substituted by [wet] (front, high-mid, unrounded vowel); or roo /ru:/ (back, high, rounded vowel) was substituted by [rɔ:] (back, mid-low, rounded vowel). From the above examples, we can explain why roundedness is the most resistant to substitution. The error pattern illustrated that students tended to substitute with phonemes that shared the same grapheme (i.e. both /i:/ and /e/ shared letter "e"; both /u:/ and /ɔ:/ shared the letter "o"). We can see that the letter has ambiguous correspondence to phonemes, and these phonemes have the same roundedness value. So, roundedness was more resistant to substitution in the nucleus substitution error.

High percentage of deletion error was observed in real-word reading task, especially the P2 students. To explain this observation, we need to look into the reading method and the stimuli of non-word and real-word reading task. During the reading of non-word or

unfamiliar real-word, students need to process the whole word and segment the word into syllables. In each syllable, students needed to convert the grapheme to phonemes to read aloud. From the qualitative analysis of error pattern, it is observed that P2 students were less able to segment words into syllable and thus whole syllable deletion was common to be observed. The poorer syllable segmentation ability may be due to the less experience with longer words in P2 level. The stimuli of the non-word reading tasks were from 2 to 7 letters with 1 to 2 syllables while the stimuli of the real-word were from 3 to 11 letters with 1 to 5 syllables. Therefore, the difficulty of reading a real unfamiliar word may be greater than reading a non-word. So, students are more likely to delete the whole syllable in the real-word reading task since there were more syllables for them to process. Thus, there was a higher percentage of deletion error in real-word reading task, especially for the P2 students.

Shortcomings are remarked in this study as the method of phonics training of the participants was not monitored. To improve the study, it is suggested that students without phonics background should be recruited and to receive phonics training with a standardized method before the tasks were carried out. This can guarantee the amount and the method of phonics training are consistent in all the groups.

The present study can be elaborated and further research questions may include studying the effect of the duration of phonics acquisition of ESL students with non-alphabetic L1 on the GPC proficiency. Also, we can study the effectiveness of phonics training on spelling non-word or unfamiliar word for ESL students with non-alphabetical L1. Moreover, a

longitudinal study can be carried out to compare the GPC and reading developmental pattern between phonics-trained and non-phonics trained students. Furthermore, study can be carried out to investigate the differences in GPC development between phonics trained ESL student with non-alphabetic L1 and students with alphabetic L1.

In conclusion, the findings of this study have provided insights into the instruction approach of English teaching in Hong Kong. The effect of phonics training on non-word and real-word reading was demonstrated. It was shown that the traditional "look and say" teaching method was not sufficient to provide development of grapheme-phoneme correspondence or help develop adequate reading skills. By explicit and systematic method of phonics training, learners would acquire a stronger awareness of letter to sound conversion, hence it facilitates the skills to segment reading unites into smaller components (from word to syllables, from syllable to onset-nucleus-coda), and to map the graphemes to the corresponding phonemes (Pearce, 1995 and Matson, 1996, sited in Cheung, 1999). Therefore, the promotion of phonics training would enhance English word learning.

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Appendix 1

Phonic Checklist (Duncan & Parkhouse, 2001)

Phonemes and graphemes (names and sounds)

A a	B b	C c	D d	E e	F f	G g	H h	I i	J j	K k	L l	M m
N n	O o	P p	Q q	R r	S s	T t	U u	V v	W w	X x	Y y	Z z

Initial consonant clusters / digraphs

bl	br	cl	cr	dr	dw	fl	fr	gl	gr	pl	pr	sc	scr	sk	sl
sm	sn	sp	spl	spr	squ	st	str	sw	tr	tw	thr	shr	sh	th	ch

Common end clusters

ld	nd	lk	nk	sk	lp	mp	sp	ct
ft	lt	nt	pt	st	xt	lf	nch	lth

Word endings

ck	ff	ll	ss	ng

Appendix 2

Non-word Reading Test

WRMT-R

G-form

dee	ap	ift	raff	bim
nan	un	fay	gat	roo
oss	pog	poe	weat	plip
dud's	shab	shie	vunhip	nigh
bufty	sy	straced	chad	than't
tadding	twem	laip	adjex	gouch
yeng	zirdn't	gaked	knoink	cigbet

H-form (examples)

tat	op	ig	dat	din

Appendix 3

Real Word Reading Test

WRAT3

Tan Reading

see	red	milk	was	then
jar	letter	city	between	cliff
stalk	grunt	huge	plot	sour
humidity	clarify	residence	urge	rancid
conspiracy	deny	quarantine	deteriorate	rudimentary

Blue Reading (Example)

in	how	finger	lame	contemporary