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# Effects of English Phonological Awareness Training on Chinese Child EFL Learners' Literacy Development

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## Abstract

Phonological awareness (PA) instruction has been attached great importance in English as a Foreign Language (EFL) research due to the observed significance of PA in the development of English literacy. But studies on Chinese child EFL learners' English PA training and its long-term effects are sparse, and research on its effects on children's English literacy development is even less. The present study is a longitudinal study following an English PA training program, aiming to investigate the long-term effect of the training on young English learners' subsequent literacy acquisition in China.

Eighty students from two intact classes in Grade One of a primary school participated in the study. Among them, forty four children in the treatment group received 10 weeks' PA training, while the rest thirty six children in the control group did not. Tests were conducted on all participants at two time points – 6 months and 12 months after the training respectively. Both tests examined participants' early English reading and spelling. And Test 2 investigated the participants' reading comprehension and PA as well. The following are the major findings: Firstly, there is long-term training effect on participants' literacy acquisition. The treatment group performed better on every literacy sub-skill test than the control group in tests conducted 6 months and 12 months after the training, showing significantly better performance on early English reading and spelling than the control group. Secondly, PA is closely related with English literacy skills, and the initial phoneme deletion is likely the most powerful predictor of children's early English reading and spelling.

**Key words:** Chinese child EFL learners; Phonological awareness; English literacy

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## INTRODUCTION

Phonological awareness (PA) refers to the ability to perceive and manipulate the sounds of spoken words (Mattingly, 1972). It is the ability to hear and manipulate the sounds in spoken words and the understanding of different ways in which oral language can be divided into smaller components and manipulated (Wagner *et al.*, 1997). Significant correlation between early PA and subsequent reading and spelling skills has been demonstrated in many studies (e.g., Bryant *et al.*, 1990; Caravolas *et al.*, 2001; Silva & Alves-Martins, 2002; Gillon, 2004).

Dickinson and Neumann (2006) assert that early childhood literacy is the best investment for facilitating the growth needed for a lifetime of success. In a narrow sense, the acquisition of literacy can be defined as acquiring the ability to both comprehend and produce written text (Juel *et al.*, 1986). Of the two major components of English reading process – word identification and comprehension – the first involves learning to convert the letters into recognizable words and the second involves accessing the meaning of the unit (Hoover & Gough, 1990; National Reading Panel, 2000). Accurate and fluent identification of words is therefore a necessary precursor to good comprehension, for this may result in less involvement of cognitive resources in lexical retrieval and lead to allocation of cognitive resources to higher level reading

comprehension (Perfetti, 2007). Spelling is the process of converting oral language to visual form by placing graphic symbols on some writing surface and spellers need to map accurately and rapidly the connection between phonemes and sub-lexical segments to graphemes (Goswani & Bryant, 1990). The English writing system is alphabetic in structure, with graphemes or graphic characters representing speech sounds and English spelling system reflects a greater degree of regularity (Wood & Connelly, 2009). The idea that phonology is the main influence on early spelling has gained support from a range of studies in English, in other alphabetic orthographies, and in non alphabetic languages (e.g. Treiman, 1993; Varnhargen *et al.*, 1997, Bryant *et al.*, 1999; Sprenger-Charolles *et al.*, 2003; Abu-Rabia & Taha, 2006).

PA is not supposed to be an intuitive or naturally developing ability, but rather may require deliberate teaching and practice opportunities (Phillips, 2008). Studies have shown that it is possible to improve average levels of PA in young children through explicit training (Bradley & Bryant, 1983; Lundberg *et al.*, 1988; Schneider *et al.*, 1997, 2000). Besides the focus on PA improvement from the training programs, researchers are also interested in the PA training effect on children's literacy development. And whether PA training has effect on reading or spelling development of children stands as a watershed here: One line of studies have found significant effect of PA training on reading and spelling (Treiman & Baron, 1983; Cunningham, 1990); while the other line have found none significant effects (Olofsson & Lundberg, 1985; Brady, 1994; Brennan & Ireson, 1997). The same controversy exits in the EFL field among the relatively sparse studies on PA training and its long-term effect assessment (Lundberg *et al.*, 1988; Bradley & Bryant, 1985; Lie, 1991; Kozminsky & Kozminsky's, 1995; Castles & Coltheart, 2004).

In China, English is a mandatory course from the primary school to the university. Children in big cities start to learn English from Grade 1 in the primary school, and others begin English learning from Grade 3. Studies have showed that English PA development of Chinese EFL learners follows in general the same order as that of English native speakers, only with fine differences (TAO *et al.*, 2005; XU *et al.*, 2004). Like native speakers, Chinese EFL learners develop their syllable and onset-rime awareness in their early years, but they develop the phoneme awareness earlier than native speakers. This is accounted for by the fact that there is no last phoneme in spoken Chinese, so the last phoneme in English is paid extra attention by Chinese EFL learners, and thus makes them develop the last phoneme awareness earlier. There are few studies on English PA training in China (LI, 2006, 2007; WANG, 2006; LI, 2007) and none of them focuses on its long-term effects. So, although beneficial effects of English PA training have been proposed, much room is left for further research. And this has laid ground for the present study to pursue the topic in more integrative way by examining the long-term effects of PA training on literacy development of Chinese child EFL learners. And the specific Chinese context of the study is expected to offer insights on the role of PA training in non-alphabetic languages. It is hoped that the investigation into the long-term effect of English PA training on child EFL learners in China can provide better understanding of the role PA plays in Chinese children's English literacy development. Unlike the previous studies on Chinese EFL learners, the present study includes all the three sublevels of PA (rhyme, syllable, and phoneme) in the training and testing phases, and measures the participants' reading and spelling performance besides their PA performance at two time points set respectively at 6 months and 12 months after the PA training. The specific research questions are:

(1) Are there long-term effects of English PA training on Chinese EFL child learners' subsequent reading and spelling skills?

(2) What are the possible relations between Chinese children' PA and their reading and spelling performance?

## 2. METHODOLOGY

### 2.1 Participants

Eighty primary school children from the Affiliated Primary School of South China Normal University (SCNU) in Guangzhou, P. R. China, participated in this study. These children were in two intact classes which they were randomly assigned to. One class with 44 children (20 girls, 24 boys) was the treatment group (TG), who were on average of 6.5 years old at the beginning of the training program. The PA training was conducted in this class. The other class with 36 children (17 girls, 19 boys) was the control group (CG), who were on average of 6.8 years old. The CG didn't receive the PA training. Both classes were taught by the same English teacher. All participants were tested on their PA before the administration of the training program and no significant differences were found between the groups on any of the PA measure (MANOVA: Pillar's Trace = 0.51, $F_{(6, 73)} = .653$, $p = .668 > .05$) (Appendix 1).

### 2.2 Instruments

Data were collected using four research instruments: PA measures, word-level reading measures, passage reading measures and spelling measures.

### 2.3 Procedures

The training program began in late September 2010, and lasted for 30 minutes each time, once in a week, 10 weeks in total. The whole training was done by one of the researchers. The training program was designed with reference to Schuele and Boudreau's (2008), following the

sequence from syllable, final sound, rime, onset, phoneme identification & matching, phoneme deletion & addition, to phoneme blending & segmentation.

Non-word recognition and pronounceable non-word reading (e.g., *nilg*) are the most frequently used word-level reading measures (Jacobi, 2008). The test of non-word recognition in the present study was designed with reference to Byrne and Fielding-Barnsley (1991) in the form of a forced-choice recognition test with 12 items (see Appendix 2). Items were constructed so that the correct response could not be detected on the basis of a single letter. For instance, the foils for *ap* were *op* and *aj*. The tester read a word and the child was required to choose the one out of the three non-words that corresponded to the word the tester read. Test items for pronounceable non-word reading were taken from Johnson and Watson's (2004) study. This test consisted of 20 simple CVC non-words, such as *nal*, *kug*, *bis* etc. For a correct score, all three sounds had to be correct in context free English pronunciation. A sound was correct if it had that pronunciation in any English word. The one which was correctly read out in English was scored one point, otherwise zero. The total score for non-word recognition and pronounceable non-word reading was 32 points.

Reading comprehension test included two subtests. In one subtest, participants were asked to do 7 multiple-choice questions after reading a 102-word story with pictures; while in the other test, they were asked to match the introduction of 4 books to their respective covers. The reading material contained 102 and 108 English words respectively. Chinese translation was provided for the new words. 1 point was given to each right choice, and the total score was 11 points.

Spelling test was designed with reference to Ding and Peng's study (1998) and Zhang and Lin's study (2002) which examined the participantss with similar background to the participants in the present study. Children were asked to spell new words which were matched with the words they had learned (old words). For example, after the old word "*bell*" was read to the students, they were asked to write "*hell*" which was a new word for them, and the old word was presented to students. The spelling test (Appendix 3) in the present study included 5 groups with 4 pairs of words in each. The first group had CVC words with same CV. The second group had CV words with same C. The third group had CVC words with same CV. The fourth group had CCVC words with the same VC. The fifth group had CVCC with the same CV. Three examples were given before the test to make the participants understand the process. The score was calculated according to the correct spelling parts. For example, for the word "*hen*", if the students wrote "*hen*", a point would be given, and "*ben*" or "*hem*" would be given 0.5 point. The total score was 20 points.

Eighty participants took part in Test 1 and seventy-eight in Test 2. The PA tests, the non-word reading and non-word recognition tests were administered in quiet lab cubes individually, while the spelling and reading comprehension tests were administered collectively in the classrooms by the researchers. All the tasks started with three practice items to which the experimenter provided immediate feedback to facilitate the participants' understanding of the task.

Test 1 was conducted at the end of the first school year (June, 2011), 6 months after PA training. The whole test process of non-word identification and non-word reading aloud was recorded. In the spelling test, the tester read the words pair by pair, and asked the subject to write the new words beside the old ones on a sheet of test paper. Each pair of words was read twice, and there was 5 seconds' stop after reading for spelling. Test 2 was administered at the end of the first semester at Grade 2 (January, 2012), 12 months after PA training. It was administered in this sequence: PA measures, non-word identification, non-word reading, reading comprehension and spelling. Because the participants were first year primary school students who just began to learn English, passage reading was beyond them at the time of Test 1. They began to learn to read English passages after Test 1 in their regular school programs and so reading comprehension measure was included only in Test 2.

## 3. RESULTS AND ANALYSIS

Firstly, participants' reading performance was investigated from two perspectives: word-level reading (non-word recognition and non-word reading) and passage reading. As is shown in Table 1, TG outperformed CG significantly on both non-word recognition and non-word reading in Test 1. In Test 2, the advantage of TG was still kept on non-word recognition, but not anymore on non-word reading. In both tests, the SD of TG was lower than that of CG ($SD = 6.64 < SD = 7.10$; $SD = 4.96 < SD = 6.46$).

Comparisons showed that the total scores of word-level reading of both groups increased significantly from Test 1 to Test 2 ($p < .01$) and there was significant difference between TG and CG. In passage reading comprehension, although the TG gained slightly higher score than that of the CG, there was no significant difference between them.

**Table 1**
**Independent-Samples T Test of TG and CG on Word-Level Reading, Reading Comprehension and Spelling**

| | Treatment group | | | Control group | | | | |
|---|---|---|---|---|---|---|---|---|
| | M | SD | N | M | SD | N | T | p (2-tailed) |
| Test 1 | | | | | | | | |
| Non-word Recognition (12) | 9.89 | 1.77 | 44 | 9.03 | 1.81 | 36 | 2.14 | .036* |
| Non-word reading(20) | 13.41 | 5.75 | 44 | 10.28 | 5.95 | 36 | 2.39 | .019* |
| Total combined | 22.30 | 6.64 | 44 | 19.31 | 7.10 | 36 | 2.60 | .011** |
| Test 2 | | | | | | | | |
| Non-word Recognition (12) | 11.09 | 1.34 | 43 | 10.29 | 1.66 | 35 | 2.38 | .02* |
| Non-word reading (20) | 14.47 | 4.42 | 43 | 12.31 | 5.38 | 35 | 1.94 | .056 |
| Total combined | 25.56 | 4.96 | 43 | 22.60 | 6.46 | 35 | 2.29 | .025* |
| Test 2 Reading comprehension | 6.89 | 1.33 | 43 | 6.53 | 1.29 | 35 | 1.02 | .288 |
| Test 1 Spelling | 15.53 | 4.82 | 44 | 10.50 | 4.73 | 36 | 4.68 | .000** |
| Test 2 Spelling | 17.67 | 4.06 | 44 | 15.34 | 5.18 | 36 | 2.25 | .027* |

Secondly, significant differences on spelling were found between two groups at both tests ($p = .000 < .01$, $p = .027 < .05$). A Test (2) × Group (2) analysis of variance showed that the main effects of Test and Group were significant ($F_{(1, 154)} = 21.21$, $p = .000 < .01$; $F_{(1, 154)} = 22.88$, $p = .000 < .01$), but there was no significant interaction between Group and Test ($F_{(1, 154)} = 3.62$, $p = .059 > .05$). All participants gained significant improvement from Test 1 to Test 2, and there was significant difference between these two groups, with TG outperforming CG.

PA measurements in Test 2 showed significant differences between TG and CG on syllable segmentation and phoneme segmentation, with TG outperformed CG (Table 2).

**Table 2**
**Independent-Samples T test of TG and CG on PA Tests**

| | Treatment group | | | Control group | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | M | SD | N | M | SD | N | T | MD | p (2-tailed) |
| Rhyme (12) | 10.00 | 1.88 | 43 | 9.57 | 2.16 | 35 | .94 | .43 | .352 |
| Syllable synthesis (8) | 7.07 | 1.06 | 43 | 6.97 | .99 | 35 | .42 | .10 | .674 |
| Syllable segmentation (8) | 7.51 | .703 | 43 | 7.03 | 1.30 | 35 | 2.10 | .48 | .039* |
| Phoneme synthesis (8) | 6.56 | 1.39 | 43 | 5.91 | 1.66 | 35 | 1.87 | .65 | .065 |
| Phoneme segmentation (8) | 6.47 | 1.94 | 43 | 5.11 | 2.34 | 35 | 2.79 | 1.36 | .007** |
| Initial phoneme (8) | 7.19 | 1.20 | 43 | 6.66 | 1.86 | 35 | 1.52 | .53 | .134 |
| Total combined (52) | 44.79 | 5.77 | 43 | 41.29 | 7.03 | 35 | 2.42 | 3.51 | .018* |

Rhyme: rhyme detection; initial phoneme: initial phoneme deletion;
* Mean difference is significant at the 0.05 level (2-tailed);
** Mean difference is significant at the 0.01 level (2-tailed);
Maximum score is given in parentheses after each task.

To look into the relationship between literacy skills and sub-skills of PA, correlation analysis and regression analysis were conducted with the data collected from Test 2. Firstly, the relationship between the sub-skills of PA and the subtests of literacy for the entire population was looked into (Table 3).

**Table 3**
**Pearson Correlations Between PA Tests and Literacy Subtests at Test 2**

| PA | Word-level reading | | Reading Comprehension | | Spelling | |
|---|---|---|---|---|---|---|
| | *r* | *p (2-tailed)* | *r* | *p (2-tailed)* | *r* | *p (2-tailed)* |
| Rhyme detection | .547 | .000** | .500 | .000** | .453 | .000** |
| Syllable synthesis | .335 | .003** | .327 | .003** | .428 | .000** |
| Syllable segmentation | .540 | .000** | .363 | .001** | .387 | .000** |
| Phoneme synthesis | .550 | .000** | .328 | .000** | .442 | .000** |
| Phoneme segmentation | .549 | .000** | .357 | .001** | .449 | .000** |
| Initial phoneme deletion | .576 | .000** | .345 | .002** | .534 | .000** |
| Total PA scores | .648 | .000** | .540 | .000** | .648 | .000** |

Significant positive correlations among PA measures, word-level reading, passage reading and spelling were found. To assess the power of each sub-skill of PA as predictors of literacy skill, Linear Regression Analysis was conducted with word-level reading, reading comprehension and spelling as dependent variables. The results are shown in Table 4, Table 5 and Table 6. In the regression equation of word-level reading, phoneme synthesis, syllable segmentation and rhyme entered as predictors. Initial phoneme deletion explained 33% of the variance of word-level reading. And together with phoneme synthesis, 48% of the variance of word-level reading ($F_{(2, 75)} = 34.22$, $p = .000$) were explained, while initial phoneme deletion, phoneme synthesis, syllable segmentation and rhyme together explained 59% of the variance in word-level reading ($F_{(4, 73)} = 26.52$, $p = .000$).

In the regression equation of spelling, phoneme synthesis, syllable synthesis and initial phoneme deletion entered as predictors. Initial phoneme deletion explained 29% of the variance of spelling. And together with syllable synthesis and phoneme synthesis, about 40% of the variance of spelling ($F_{(3, 74)} = 16.06$, $p = .000$) was explained. In the regression equation of reading comprehension, rhyme and syllable segmentation entered as predictors. Rhyme explained 25% ($F_{(1,76)} = 25.30$, $p = .000$) of the variance, and together with syllable segmentation, 30% of the variance ($F_{(2, 75)} = 16.09$, $p = .000$) was explained.

To sum up, nearly all PA sub-skills entered the regression equations of word-level reading, spelling and reading comprehension as predictors except for phoneme segmentation, which proved the vital role of PA in English literacy development of the EFL child learners. Besides, the initial phoneme deletion was found to be the most powerful predictor of word-level reading ($F_{(1, 76)} = 37.71$, $p = .000 < .01$) and spelling ($F_{(1, 76)} = 30.39$, $p = .000 < .01$). And it explained 33% of the variance of word-level reading and 29% of the variance of spelling. So this lends support to the proposal that phoneme awareness is the strongest predictor of word-level reading and spelling abilities.

**Table 4**
**Linear Regression Analysis with Word-Level Reading and PA Tests**

| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate |
|---|---|---|---|---|
| Initial phoneme deletion | .576a | .332 | .323 | 4.804 |
| Phoneme synthesis | .691b | .477 | .463 | 4.277 |
| Syllable segmentation | .749c | .561 | .543 | 3.945 |
| Rhyme | .770d | .592 | .570 | 3.828 |

a. Predictor: (constant), initial phoneme deletion;
b. Predictors: (constant), initial phoneme deletion, phoneme synthesis;
c. Predictors: (constant), initial phoneme deletion, phoneme synthesis, syllable segmentation;
d. Predictors: (constant), initial phoneme deletion, phoneme synthesis, syllable segmentation, rhyme.

**Table 5**
**Linear Regression Analysis with Comprehension and PA Tests**

| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate |
|---|---|---|---|---|
| Rhyme | .500a | .250 | .240 | 1.718 |
| Syllable segmentation | .548b | .300 | .282 | 1.670 |

a. Predictors: (constant), rhyme; b. Predictors: (constant), rhyme, syllable segmentation.

**Table 6**
**Linear Regression Analysis with Spelling and PA Tests**

| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate |
|---|---|---|---|---|
| Initial phoneme deletion | .534a | .286 | .276 | 4.019 |
| Phoneme synthesis | .604b | .365 | .348 | 3.813 |
| Syllable synthesis | .635c | .403 | .379 | 3.723 |

a. Predictors: (constant), initial phoneme deletion;
b. Predictors: (constant), initial phoneme deletion, phoneme synthesis;
c. Predictors: (constant), initial phoneme deletion, phoneme synthesis, syllable synthesis.

## 4. DISCUSSION

The effects of PA training on literacy development were found 12 months later on child EFL learners in China.

Firstly, the total PA scores of the TG were higher than that of CG, with significant difference 12 months after the PA training, showing the maintained long-term effects of the PA training. Besides, the SD of CG is much higher than that of TG (7.03 and 5.52 respectively), which may suggest that participants in TG progressed more homogeneously after training than those in CG. The long-term effect of training is showed most prominently on phoneme level, suggesting that PA training has significantly facilitated the improvement of phoneme awareness on Chinese EFL child learners. It may be true that phoneme awareness does not develop efficiently and autonomously but rather requires training and practice opportunities. So, after PA training TG scored significantly higher than CG at Test 1 with regard to phoneme synthesis and phoneme segmentation, although phoneme tasks are supposed to be more complicated and difficult than syllable tasks in theory. The syllable segmentation scores of both groups were very high, M = 7.51 for TG and M = 7.03 for CG, approximating the ceiling effect.

For TG, the PA development order was: syllable awareness, phoneme awareness and rhyme. For CG, the PA development order was: syllable awareness, rhyme and phoneme awareness. These results conform to the findings of other studies done in China (XU & DONG, 2005; XU, 2002; YANG *et al.*, 2007), indicating that Chinese child EFL learners develop their syllable and onset-rhyme awareness in their early years, while phoneme awareness is picked up relatively late. The developmental trajectory of CG is in accordance with that of native speakers and ESL learners, from large unit to small unit, and this is believed to be the natural development for EFL child learners in China. On the other hand, the phoneme awareness which is the most sophisticated component

in PA has benefited the most from the training and so dramatically changed the developmental rout for TG in the present study.

Secondly, in the reading comprehension test of Test 2, TG performed better than CG, but there was no significant difference ($t_{(78)} = .79$, $p = .43 > .05$). It added positive data to the previous findings that adequate phonological skills may be necessary, but not sufficient, for learning to read effectively (Kozminsky & Kozminsky, 1995). We believe that PA alone cannot account for children's reading comprehension of English as reading comprehension is influenced by many factors and PA is only one of them (Kate & Cain, 2009; Wood & Connelly, 2009). Reading comprehension is a dynamic and an interactive process. The acquisition of good word-level reading alone does not guarantee adequate comprehension (Yuill & Oakhill, 1991). This is also part of the reason underlying the belief that it is not the PA will cause children to be able to read but that it will cause them to be better at learning to read at some later date: it is a distal, not a proximal, cause of reading ability (Castles & Coltheart, 2004). So other skills may need to be trained besides PA.

TG significantly outperformed CG on word-level reading 6 months and 12 months after the training, and the TG developed more homogeneously with smaller SD than that CG. The success in word-level reading may be ascribed to the improvement in decoding that occurs when the child can appreciate the principles of phonological segmentation and blending. Once word recognition becomes automatic and rapid, cognitive resources can be concentrated on the task of interpreting the grapheme-phonemic code (Kozminsky & Kozminsky, 1995).

Both groups kept on improving on spelling from Test 1 to Test 2, and TG outperformed CG on spelling in both tests. We chose this spelling test pattern – the match between familiar and new words – to avoid the intervention of memory effect when familiar words are used. According to Patterson and Morton (1985), there are two ways in the non-lexical transfer mechanism between orthography and phonological representation: one is grapheme-to-phoneme correspondence and the other one is the transfer between letter pattern and sound cluster, which is based on analogy. The children who have better PA could use different transfer methods between sound and orthography flexibly, and thus could perform spelling tasks better.

Thirdly, as for the relationship between PA and literacy skills, the regression analysis shows that initial phoneme deletion explained 33% of the variance of word reading and 29% of the variance of spelling, thus being the strongest predictor of word-level reading ability and spelling ability as what has been found in previous studies (Yopp, 1988; Kozminsky & Kozminsky, 1995). The significant role of phoneme awareness found in this study adds support to the belief that phoneme awareness has emerged as a significant predictor of reading and spelling (Caravolas *et al.*, 2001; Juel, 1998). In addition, the present study also found that syllable segmentation has significant predictive power in participants' reading performance and spelling performance, which is different from Lundberg's (1988) finding that only phonemic tasks was the predictor of reading and spelling. Findings from the present study support that syllable and rhyme awareness was important in reading acquisition (Bradley & Bryant, 1983; 1985; Goswami, 1993; 1999).

## 5. GENERAL CONCLUSIONS

In the investigation of the long-term effect of the English PA training on English PA development, the result shows that there is long-term effect of training on PA 6 months and 12 months after the training. Phoneme awareness benefited most from PA training. The TG performed better than the CG on reading comprehension, but without significant difference. Adequate phonological skills may be necessary but not sufficient for learning to read effectively. There were effects of the training on spelling 6 months and 12 months later, with the TG significantly outperforming the CG. So, PA has played an important role in children's English spelling.

With regard to the relation between PA and literacy acquisition, PA has been found to be highly correlated with word-level reading, reading comprehension and spelling for both groups. Regression analysis demonstrated that initial phoneme deletion was the most powerful predictor of word-level reading and spelling. To be specific, initial phoneme deletion, phoneme synthesis, syllable synthesis and rhyme were the predictors of word-level reading. Initial phoneme deletion, phoneme synthesis and syllable synthesis were the predictors of spelling. Rhyme and syllable segmentation were the predictors of reading comprehension. So, phoneme awareness played a very important role in word-level reading and spelling.

The obvious long-term effect of the training gives strong support to the feasibility of implementing PA training in intact class. English teachers should be encouraged to make some explicit instruction on English PA. Explicit instruction can help them improve PA, and be especially beneficial for those students with difficulties in PA. The strong correlation between PA and literacy skills illustrates that PA plays an important role in literacy acquisition and it can help to detect and remedy the children with reading dyslexia or spelling difficulties. In a word, phonological awareness should be paid enough attention to by teachers.

In the present study, the long-term effect of training on PA was found, and the phoneme awareness benefits the most from the training. In the future studies, the training duration and intensity should be considered as potential influence factors too. Our training duration lasted for 5

hours in total and spread over 10 weeks, one session per week and 30 minutes each session. Although the National Reading Panel (NICHD, 2000a, cited from Schuele & Boudreau, 2008) found that 5 to 18 hours of instruction or intervention provided substantial benefit, with longer programs not necessarily leading to greater benefit, it was for English native speakers. We suppose that the training on EFL learners may need to take a longer duration than what is suggested for the native speakers. Lundberg *et al.* (1988) conducted a 8-month training program and comprised daily sessions of 15-20 minutes of metalinguistic exercises and games. Kozminsky and Kozminsky (1995) gave a training which also lasted for 8 months, and there was structured 20-min group activity twice a week and two 5-min practice sessions a day. Schneider *et al.* (1997) designed a training lasted for 6 months and included daily 15-20 minute sessions. All these studies have much longer duration than the intervention on which this study is based on. Besides, the training sequence of the components of PA needs to be taken into consideration. Future studies can manipulate the difference sequence of the PA constituents at three different levels to achieve a more convincing and thorough understanding both of the intervention model and the training effects on language learners' literacy development.

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## APPENDIX 1

**Independent-Samples T Test of the Treatment Group and Control Group on PA Tests**

| | Treatment group | | | Control group | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | **M** | **SD** | **N** | **M** | **SD** | **N** | **T** | **MD** | ***P* (2-tailed)** |
| Rhyme (12) | 5.59 | 3.87 | 44 | 6.00 | 3.73 | 36 | -.478 | -.41 | .63 |
| Syllable synthesis (8) | 5.16 | 1.18 | 44 | 5.28 | 1.70 | 36 | -.37 | -.12 | .71 |
| Syllable segmentation (8) | 6.11 | 1.37 | 44 | 6.33 | 1.57 | 36 | -.67 | -.22 | .51 |
| Phoneme synthesis (8) | 1.86 | 2.09 | 44 | 1.91 | 1.86 | 36 | -.12 | -.53 | .91 |
| Phoneme segmentation (8) | 0.98 | 1.23 | 44 | 1.11 | 1.39 | 36 | -.46 | -.13 | .65 |
| Initial phoneme (8) | .61 | 1.24 | 44 | .75 | 1.48 | 36 | -.45 | -.14 | .66 |
| Total combined (52) | 20.32 | 6.46 | 44 | 21.39 | 7.48 | 36 | -.69 | -1.07 | .49 |

## APPENDIX 2

A. Non-word Recognition Test Items:

| | | | |
|---|---|---|---|
| 1. | ag | ig | im |
| 2. | lut | sif | sut |
| 3. | fes | des | fup |
| 4. | pilk | pont | filk |
| 5. | timp | rimp | roft |
| 6. | frot | fot | bril |
| 7. | sep | rolk | skep |
| 8. | yit | polt | yilt |
| 9. | bot | runk | bont |
| 10. | wusp | besk | wup |
| 11. | polkid | hutik | hintred |
| 12. | basito | clobanto | casima |

B. Non-word Reading Items:

| | | | | |
|---|---|---|---|---|
| hig | nal | kug | bis | gok |
| dep | foy | kun | ged | lar |
| jek | lan | mip | pos | ruk |
| dal | ped | fik | lom | sul |

## APPENDIX 3

Spelling Test

| | **Old words** | **New words** |
|---|---|---|
| 1. | pen | hen |
| 2. | dog | fog |
| 3. | ball | wall |
| 4. | foot | soot |
| 5. | boy | joy |
| 6. | sir | fir |
| 7. | how | bow |
| 8. | car | bar |
| 9. | bus | bug |
| 10. | cat | cab |
| 11. | bird | birth |
| 12. | doll | dot |
| 13. | fat | brat |
| 14. | dad | clad |
| 15. | good | stood |
| 16. | book | crook |
| 17. | leg | left |
| 18. | run | rush |
| 19. | bed | belt |
| 20. | bag | band |