

# Enhancing Reading Comprehension among EFL Learners: The Effectiveness of Phonological Awareness Interventions

Li Lijing, Priscilla Shak\*, Wendy Hiew

Centre for the Promotion of Knowledge and Language Learning, Universiti Malaysia Sabah, Malaysia

Email: LILIJING\_DU23@iluv.ums.edu.my, wenhiew@ums.edu.my

\*Corresponding Author Email: pshak@ums.edu.my

DOI Link: <http://dx.doi.org/10.6007/IJARPED/v15-i1/27590>

*Published Online:* 12 February 2026

## Abstract

The purpose of this study is to examine the effectiveness of PA intervention on the reading comprehension performance of Chinese EFL learners. A total of 88 students from a senior high school in Qiqihar, Heilongjiang Province, participated in this study, with 44 students assigned to the experimental group and 44 to the control group. This study employed a quasi-experimental approach using a pre-test and post-test design. Both groups completed pre- and post-tests, but only the experimental group received PA intervention, which integrated phonics instruction, the International Phonetic Alphabet (IPA), and the analogy teaching method. The control group received delayed intervention to minimize potential bias. Data were collected and analyzed using SPSS version 29. Descriptive statistics and paired sample t-test methods were applied. The results revealed a significant mean difference between the pre-test and post-test scores of the experimental group ( $M_{pre} = 18.41$ ,  $SD = 4.33$ ;  $M_{post} = 22.64$ ,  $SD = 5.03$ ), indicating that PA intervention significantly enhanced reading comprehension performance. It was concluded that targeted PA-based instruction can effectively improve EFL learners' reading comprehension, offering practical implications for English teaching in Chinese secondary schools.

**Keywords:** Phonological Awareness, EFL Learners, Reading Comprehension, Intervention, Effectiveness

## Introduction

Reading comprehension is a fundamental component of academic success and lifelong learning; however, it remains a persistent challenge for many learners of English as a Foreign Language (EFL). Despite years of formal instruction, a substantial proportion of EFL learners continue to experience difficulty in understanding written texts, particularly in contexts where English exposure is limited to the classroom. Existing reading instruction in many EFL settings tends to prioritize vocabulary memorization and test-oriented strategies, often overlooking the foundational role of phonological awareness in efficient word recognition and fluent reading. As a result, learners may develop surface-level reading skills without establishing the underlying decoding mechanisms necessary for deep comprehension.

Phonological awareness, which involves the ability to recognize and manipulate the sound structure of language, has been widely recognized as a critical precursor to reading development in first language research. Nevertheless, its instructional value in EFL contexts—especially through systematic intervention—has received comparatively limited empirical attention. This gap is particularly evident in secondary-level EFL education, where learners are often assumed to have already mastered basic decoding skills, despite ongoing difficulties in reading comprehension. Therefore, investigating the effectiveness of phonological awareness interventions is both timely and necessary, as it addresses a key yet underexplored mechanism underlying reading comprehension difficulties among EFL learners and offers a theoretically grounded approach to enhancing reading outcomes.

In response to these challenges, researchers and educators have increasingly turned to various forms of intervention programs to enhance reading development. A wide range of intervention approaches have been introduced, targeting areas such as phonics instruction, vocabulary enrichment, fluency practice, and comprehension strategies. As Jamshidifarsani et al. (2019) note in their analytical review of technology-based reading intervention programs, systematic and targeted interventions have demonstrated substantial benefits in improving reading outcomes for elementary-level learners. Similarly, Horowitz et al. (2016) emphasize that effective reading interventions often require a multidimensional approach, integrating different domains of reading instruction rather than focusing narrowly on a single skill. These findings underscore the importance of designing comprehensive frameworks that address the interconnected components of reading development.

Within this context, PA has been identified as a foundational component of reading instruction, particularly for EFL learners whose first language differs significantly from English in its phonological system. PA refers to the ability to identify, analyze, and manipulate the sound structures of language, including phonemes, syllables, and rhymes. Strong PA skills provide the basis for decoding new words and establishing sound-symbol correspondence, which are essential for reading development. However, PA alone is insufficient. Students must also build a robust vocabulary to understand the meanings of texts and develop ORF to read smoothly, accurately, and with appropriate prosody. Therefore, effective reading interventions should integrate these three interrelated domains—PA, vocabulary, and ORF—to support comprehensive reading comprehension proficiency.

The intervention framework adopted in this study is designed precisely to meet these needs by integrating PA skills, vocabulary enhancement, and ORF development. This integrated approach not only strengthens students' core literacy abilities but also helps them to decode unfamiliar words, comprehend passages, and engage with reading materials more fluently. The intervention aims to create a supportive learning environment in which students practice and apply these interrelated skills cohesively. For example, phonics instruction and the International Phonetic Alphabet (IPA) are used to strengthen decoding, analogy teaching methods are employed to help students transfer knowledge across contexts, and vocabulary activities are embedded to reinforce comprehension.

To ensure the systematic and effective implementation of the intervention, this study employs the ADDIE instructional design model, which consists of five phases: Analysis, Design, Development, Implementation, and Evaluation. In the analysis stage, learners' needs and

reading challenges are identified. The design stage specifies the instructional objectives, materials, and strategies that integrate PA, vocabulary, and ORF. Development involves creating and refining the teaching materials, while implementation ensures that the intervention is delivered consistently to the experimental group. Finally, the evaluation stage assesses the outcomes of the intervention through pre- and post-test measures, ensuring that the effectiveness of the program can be reliably determined. By applying the ADDIE model, the study ensures that the intervention is not only theoretically grounded but also practically structured, allowing for replication and refinement in other educational contexts.

This research is particularly significant in the Chinese EFL context, where many high school students face persistent difficulties in reading comprehension despite years of formal English instruction. The phonological differences between English and Chinese, combined with limited exposure to authentic English reading materials, often make it challenging for students to develop fluent and accurate reading skills. By focusing on PA as a core intervention strategy, while simultaneously supporting vocabulary growth and ORF development, this study aims to provide an effective model for improving reading comprehension among Chinese EFL learners. Moreover, by adopting a quasi-experimental design with both pre- and post-tests, this research provides empirical evidence of the impact of PA-based interventions on reading achievement.

In summary, this study seeks to contribute to the growing body of research on reading interventions by examining the effectiveness of a PA-based program that integrates vocabulary and ORF within a systematic instructional design framework. By addressing the foundational skills that underpin reading comprehension, this study not only advances theoretical understanding of reading development in EFL contexts but also provides practical implications for teachers and policymakers seeking to improve English literacy outcomes in Chinese secondary schools.

### **Problem Statement**

Reading proficiency is one of the most critical skills for academic success and personal development, particularly for English as a Foreign Language (EFL) learners in China. Despite years of English instruction in schools, many Chinese secondary students continue to experience persistent difficulties in reading comprehension. These challenges often stem from weak foundational skills such as PA, limited vocabulary knowledge, and insufficient ORF. The phonological differences between English and Chinese, combined with a reliance on rote memorization and translation-based learning strategies, exacerbate these difficulties. As a result, students struggle not only with decoding unfamiliar words but also with constructing meaning from texts, which hampers their overall reading performance.

Previous research has demonstrated that interventions targeting reading skills can effectively improve students' performance when designed systematically and implemented consistently (Jamshidifarsani et al., 2019; Horowitz et al., 2016). However, many existing programs focus narrowly on one aspect of reading, such as decoding or comprehension strategies, without addressing the interdependence of PA, vocabulary, and ORF. This fragmented approach often limits the long-term effectiveness of interventions. For Chinese EFL learners, a more integrated framework is needed to strengthen their foundational reading skills and enhance overall reading comprehension.

Phonological awareness, in particular, plays a crucial role in helping learners establish sound-letter correspondences and decoding strategies, yet it remains underemphasized in many Chinese classrooms. Vocabulary knowledge provides the semantic foundation necessary for understanding texts, while oral reading fluency bridges decoding and comprehension by enabling smooth, accurate, and expressive reading. A holistic intervention that combines these three components—implemented through systematic instructional design such as the ADDIE model—has the potential to produce meaningful improvements in reading outcomes.

Therefore, this study applies a quasi-experimental design to investigate the effectiveness of a PA-based intervention, which integrates vocabulary development and oral reading fluency, in improving the reading comprehension proficiency of Chinese EFL learners in a senior high school in Heilongjiang Province. By administering pre- and post-tests to both experimental and control groups, the study seeks to provide empirical evidence on whether PA interventions can significantly enhance reading achievement compared to traditional instruction.

### **Significance of the Study**

The significance of this study lies in its direct relevance to multiple stakeholders in EFL education and its potential to inform evidence-based instructional practices. For EFL learners, particularly those who continue to struggle with reading comprehension despite prolonged exposure to English, the findings provide a targeted and cognitively grounded pathway to improving reading outcomes by strengthening phonological awareness skills. For teachers and curriculum designers, this study offers practical insights into how phonological awareness interventions can be systematically integrated into reading instruction, moving beyond vocabulary-heavy and test-driven approaches toward more balanced and effective literacy development. Moreover, the results contribute to teacher training and instructional decision-making by demonstrating the instructional value of addressing foundational decoding-related skills even at the secondary level. At a broader level, the study benefits educational policymakers and researchers by providing empirical evidence to support the inclusion of phonological awareness-based instruction in EFL curricula, thereby bridging the gap between established reading theories and classroom practice. Collectively, these contributions highlight the practical utility and educational relevance of phonological awareness interventions in enhancing reading comprehension among EFL learners.

### *Novelty and Contribution of the Study*

The novelty of this study lies in the development and empirical validation of an integrated theoretical framework that conceptualizes EFL reading comprehension as a dynamic outcome of phonological awareness-driven decoding processes, in which vocabulary functions as a mediating carrier of meaning and oral reading fluency serves as a catalytic mechanism within instructional design. Distinct from prior research that has examined phonological awareness and reading comprehension as isolated constructs, this study explicitly links phonological awareness interventions to reading comprehension development through a structured and theory-driven instructional pathway. Furthermore, the incorporation of analogy-based instructional strategies represents a pedagogical innovation that enables learners to internalize abstract English phonological patterns by mapping them onto more familiar Pinyin-based phonological knowledge. From a social sciences perspective, this framework advances understanding of how cognitive processes, instructional intervention, and learning

outcomes interact in second language literacy development, thereby contributing to theoretical discussions in applied linguistics and EFL pedagogy.

## Literature Review

### *English Teaching in China*

English education in China has developed under continuous reform and policy guidance from the Ministry of Education (MoE). In the Accurate Policy Based on Students' Academic Level (Ministry of Education of the People's Republic of China, 2021), it was clearly stated that English teachers and learners should strengthen their competence in reading comprehension and applied writing. Earlier, in 2018, the MoE emphasized enhancing students' holistic English proficiency, particularly in listening and speaking, to promote communicative ability in authentic contexts.

English education in China generally progresses through four main stages. The first stage is primary school, which typically spans six years and marks the starting point of students' formal English learning. Depending on regional policies, English instruction may begin in Grade One or Grade Three. During this stage, English learning tends to be less systematic, as pupils are introduced to basic words and simple sentence patterns with limited phonological or metalinguistic focus (Chen, 2016).

The second stage is junior middle school, lasting three years. Together with the primary stage, this period constitutes China's Compulsory Education, where tuition fees are fully covered by the government. However, English instruction remains largely examination-oriented. Classroom teaching commonly relies on simple reading aloud, text recitation, and question-answer routines, while communicative and PA English instruction practices receive limited attention (Chen, 2016; Bu, 2018; Xiao, 2017).

The third stage, senior high school, also spans three years and culminates in the College Entrance Examination (CEE), which plays a decisive role in university admission. Due to the CEE's focus on reading and writing while excluding speaking and listening from its scoring criteria, both teachers and students tend to prioritize written language skills and grammatical accuracy. This exam-driven orientation results in a persistent neglect of PA and Oral Reading fluency (Liu, 2018).

The final stage is college education, where English is a compulsory course for non-English majors during the first two academic years. Students are required to take the College English Test Band-4 (CET-4), administered biannually nationwide. Although CET-4 assesses reading, listening, and writing, it does not include a speaking component, mainly due to difficulties in large-scale evaluation and time constraints (Wang & Chen, 2023). Consequently, many learners marginalize speaking practice and instead focus on skills that are directly tested.

Overall, English education in China remains strongly influenced by examination demands, which has historically limited the balanced development of language skills. As a result, while national policies have increasingly emphasized integrated competence and communicative ability, classroom instruction continues to prioritize test-related reading and writing skills over phonological or oral aspects of English learning (Zhang, 2019).

*A Critical Examination of the Trends and Gaps in Reading Intervention Research*

A growing body of research has indeed documented the efficacy of diverse interventions in improving reading outcomes among various student populations. However, a critical synthesis of these findings reveals not only convergent trends but also important tensions and limitations in the current pedagogical landscape.

The consistent positive outcomes reported across studies—such as those by Abdulkader et al. (2009) using multiple intelligences-based programs with mnemonic activities to improve comprehension, Akyol et al. (2019) employing language modeling and generative activities to enhance fluency and reduce errors, and Denton et al. (2014) implementing explicit instruction with multi-activity approaches to develop decoding skills—collectively build a strong case for structured, teacher-led pedagogical interventions. This body of evidence notably prioritizes the mastery of foundational and executive skills, including decoding, fluency, and word recognition. The comparative findings of Calet et al. (2017), which demonstrated the superiority of prosodic training through language modeling over automatization training, and Jones et al. (2018), who found direct instruction with mnemonic strategies more effective than computer-assisted approaches, further reinforce a paradigm that is predominantly remedial and code-based.

While this paradigm proves effective for its stated goals, its dominance invites critical scrutiny. The overwhelming focus on foundational skills, as seen in the works of Levlin et al. (2020) using systematic phonics instruction with gaming elements and Gholami et al. (2016) comparing phonetic and holistic methods through language modeling, raises the question of whether the field is adequately addressing the development of higher-order literacy competencies. The instrumental and epistemic levels of reading—which involve using reading for research, critical analysis, and knowledge creation—are conspicuously absent from these intervention targets. Consequently, the prevailing model risks producing students who can decode text but may not be equipped to engage with it critically or creatively.

Despite these advances, most existing interventions have been conducted in native or ESL contexts, with limited applicability to EFL learners in China, whose linguistic background and orthographic experience differ substantially. Therefore, further research is needed to explore contextually appropriate instructional models. The present study seeks to address these gaps by (1) adopting an analogy-based teaching approach that leverages Chinese learners' familiarity with Pinyin to facilitate English phonological awareness; (2) integrating phonics instruction with International Phonetic Alphabet (IPA) learning to enhance decoding and pronunciation consistency; and (3) embedding ORF practice as a mediating component to promote the bidirectional development of phonological awareness and reading comprehension. By combining these elements, the study aims to provide a theoretically grounded and pedagogically feasible intervention model tailored to the Chinese EFL context.

*Previous Studies regarding the relationship between PA and reading*

A growing body of research has highlighted the role of PA in improving reading outcomes across different contexts. For example, Zhang and Lee (2017) demonstrated that phonological awareness and vocabulary size significantly predicted English reading ability among Chinese high school students with learning difficulties, underscoring the interconnectedness of PA, vocabulary, and reading comprehension. Similarly, Bai et al. (2020) found that in Chinese

school-aged children, reading fluency was closely associated with both phonological processing and cognitive factors, suggesting that PA skills form a foundation for later reading fluency.

ORF has also been examined as a key mediating factor. Ecalte et al. (2021) showed in a large-scale study with first graders that decoding skills and fluency together explained substantial variance in reading comprehension, lending support to automaticity theory. Groen, Veenendaal, and Verhoeven (2019) further highlighted the role of prosody in ORF, showing that prosodic sensitivity was linked to better comprehension outcomes among poor comprehenders. In a Chinese EFL context, Hsu, Chan, and Ho (2023) confirmed that reading fluency served as a bridge between decoding and comprehension, reinforcing the argument that ORF mediates the relationship between PA and RC.

Finally, reading comprehension research has consistently emphasized the integration of multiple skills. Butterfuss, Kim, and Kendeou (2020) noted that RC is a multidimensional construct requiring decoding, vocabulary, and higher-level integration processes. Mar, Djikic, and Oatley (2008) provided evidence that reading not only builds knowledge but also enhances social abilities and self-concept, suggesting far-reaching cognitive and affective benefits.

Taken together, these findings provide robust support for the Lexical Restructuring and Interactive Models of Reading. PA contributes to the restructuring of lexical representations, ORF facilitates automatic and fluent text processing, and RC represents the ultimate goal of integrating linguistic and cognitive resources. This framework aligns with the current study's aim of investigating whether a PA-based intervention, enhanced by vocabulary instruction and ORF practice, can significantly improve EFL senior high school students' reading comprehension.

#### *Addie model*

The instructional design of the intervention in this study was guided by the ADDIE model, a systematic framework widely used in educational program development. ADDIE stands for Analysis, Design, Development, Implementation, and Evaluation, representing a cyclical process that ensures instructional effectiveness and continuous improvement (Molenda, 2003). Each stage of the model played a crucial role in structuring and refining the PA-based intervention. See table 1.1.

Table 1.1  
*The ADDIE Model*

Stages	Procedures
1. Analysis	<p>Assessments identify students' reading difficulties through classroom observation and students feedback, focusing on PA, vocabulary, and oral reading fluency.</p> <p>The curriculum is analyzed to select relevant vocabulary from textbooks, ensuring alignment with students' learning context.</p> <p>Specific needs related to decoding, word recognition, and comprehension are determined by self-rating and communicating with teachers to define intervention goals.</p>
2. Design	<p>Develop an integrated intervention plan combining PA activity, vocabulary instruction, and oral reading fluency practice.</p> <p>Activities include:</p> <p>Sound blending and segmenting exercises to build PA.</p> <p>Teaching vocabulary in context to reinforce meaning and improve word recognition.</p> <p>Structured fluency practice with leveled passages to enhance reading accuracy and expression.</p> <p>Clear objectives are outlined: improving decoding, word recognition, and comprehension skills.</p>
3. Development	<p>Instructional materials are created, including:</p> <p>PA worksheets and interactive activities.</p> <p>Context-based vocabulary practice exercises.</p> <p>Fluency passages with guidelines for smooth and accurate reading.</p> <p>Develop tools to assess progress in PA, vocabulary acquisition, fluency, and comprehension.</p>
4. Implementation	<p>Deliver the intervention over 8 weeks, with 2 lessons per week.</p> <p>Lessons focus on:</p> <p>PA exercises to strengthen decoding.</p> <p>Vocabulary instruction using textbook words to build context familiarity.</p> <p>Oral fluency practice for improved accuracy, rate, and expression.</p> <p>Provide ongoing feedback and support during activities.</p>
5. Evaluation	<p>Measure improvement through pre- and post-tests assessing PA, vocabulary knowledge, fluency, and comprehension.</p> <p>Use student feedback (e.g., fluency readings and vocabulary quizzes) to make instructional adjustments.</p> <p>Analyze outcomes to evaluate the intervention's effectiveness in improving PA, vocabulary size, word decoding, oral reading fluency and reading comprehension.</p>

The teaching intervention for the experimental group spans over two months, involving phonics lessons twice a week for a total duration of eight weeks. Throughout this period, the vocabulary chosen from the first three compulsory English textbooks will be actively utilized for practice sessions. Prior to and following practice, comprehensive tests will be used to evaluate their proficiency. Overall, the ADDIE model provided a systematic and iterative framework that ensured the PA-based intervention was theoretically grounded, pedagogically coherent, and empirically verifiable. The structured sequence from analysis to evaluation facilitated both the design integrity and the practical effectiveness of the instructional implementation.

### **Theoretical Framework**

This study adopts the Lexical Restructuring Hypothesis (LRH) (Metsala & Walley, 1998) within the broader Interactive Model of Reading (Stanovich, 1980) as its main theoretical underpinning. The LRH posits that as children's vocabularies expand, their lexical representations become increasingly segmental, thereby supporting the development of PA. This restructuring process enhances the ability to manipulate sounds, which, in turn, facilitates decoding, ORF, and reading comprehension (RC). The Interactive Model of Reading complements this by emphasizing that reading involves both bottom-up processes (decoding and PA) and top-down processes (background knowledge, lexical access), which interact dynamically to support comprehension. In the context of EFL learning, this dual emphasis is crucial because learners often rely on both phonological decoding skills and higher-order vocabulary knowledge to make sense of texts.

### **Conceptual Framework**

A conceptual framework illustrates the hypothesized relationships among variables in this study (see Figure 1). The independent variable (IV) is PA, which is expected to influence the dependent variable (DV), reading comprehension (RC), both directly and indirectly. The mediating variable (MV), ORF, is hypothesized to carry the effect of PA on RC by reflecting learners' ability to decode accurately and fluently. Additionally, vocabulary size functions as a supporting path that strengthens the relationship between PA and RC by enriching lexical representations and facilitating semantic access.

This framework therefore posits a multi-pathway model in which PA exerts its influence on RC through both fluency-based mechanisms and lexical restructuring mechanisms, consistent with LRH and the Interactive Model of Reading.

### **Research Questions and Research Hypotheses**

In the current study, the following research questions were put forward to investigate the Effectiveness of PA Interventions.

RQ1:

What is the mean difference in reading comprehension achievement among Chinese EFL senior high school students before and after the implementation of a PA-based intervention?

RQ2:

To what extent is the PA-based intervention, supported by vocabulary enhancement and oral reading fluency, effective in improving the reading comprehension proficiency of Chinese EFL senior high school students compared to traditional instruction?

In alignment with the research question, two hypothesis were formulated as follows:

**RH1:**

There is a statistically significant difference in the reading comprehension achievement of Chinese EFL senior high school students before and after the implementation of the PA-based intervention.

**RH2:**

The PA-based intervention, when integrated with vocabulary enhancement and ORF practice, significantly improves the reading comprehension proficiency of Chinese EFL senior high school students compared to traditional instruction.

## Methodology

This study employed a quasi-experimental design consisting of two stages: a pilot study and a main study. Both stages followed a pre-test, treatment, and post-test structure to examine the effectiveness of PA interventions on students' reading comprehension, vocabulary size, and oral reading fluency.

In the pilot study, a total of 29 senior high school students participated, with 15 assigned to the experimental group and 14 to the control group. At the beginning, both groups completed a pre-test that measured their baseline levels of phonological awareness, vocabulary knowledge, oral reading fluency, and reading comprehension. The experimental group then received targeted intervention sessions focusing on phonological awareness training, which integrated analogy strategies between English phonetics and Chinese Pinyin, and practice activities using vocabulary from their textbooks. Meanwhile, the control group continued with traditional classroom instruction without explicit training in phonological awareness. At the end of the pilot stage, both groups took a post-test under the same conditions. To ensure fairness, the control group was provided with the intervention materials and activities after the post-test, serving as a delayed treatment. The pilot study not only allowed refinement of the intervention procedures but also ensured the reliability and clarity of test instruments before the main study.

In the main study, 88 students were recruited, evenly divided into an experimental group ( $n = 44$ ) and a control group ( $n = 44$ ). The procedure was parallel to the pilot study but conducted on a larger scale. Both groups began with a pre-test to establish baseline data. The experimental group received systematic phonological awareness intervention across eight weeks, with two sessions per week, focusing on segmenting, blending, and manipulating English sounds in relation to vocabulary and reading comprehension tasks. The control group, on the other hand, continued with traditional teaching practices aligned with the school curriculum, without targeted phonological awareness activities. Following the intervention period, both groups completed a post-test under identical conditions. Similar to the pilot stage, the control group was also given access to the intervention program after the post-test as a delayed treatment, ensuring equity and ethical responsibility.

By dividing the study into these two stages, the pilot ensured the appropriateness of research instruments and procedures, while the main study provided the statistical power and robustness required to test the hypotheses. The consistent structure of pre-test, treatment, and post-test across both groups and stages allowed valid comparisons and meaningful conclusions about the role of phonological awareness in EFL learners' reading development.

### *Research Design*

According to De Vaus, D. (2001), the strategy or framework utilized to carry out a research study is known as the research design. It outlines the approach and methods applied to data collection and analysis in order to address the research questions and test hypotheses. This study adopted a quasi-experimental pre-test–post-test design (see Figure 3.1) to examine the effect of PA intervention on senior high school EFL learners' reading comprehension proficiency.



Figure 3.1 Flowchart for the Research Design

### Research Sample

The participants in this study were drawn from a senior high school in Qiqihar, Heilongjiang Province, China. The study was conducted in two stages: a pilot study and the main experiment. In the pilot study, 29 students were selected, comprising 15 students in the experimental group and 14 in the control group. In the main study, a total of 88 students participated, with 44 assigned to the experimental group and 44 to the control group. The participants were all senior high school students enrolled in the same grade level to ensure comparability.

### Research Instrumentation

For both the pilot and the main studies, the students completed a pre-test and a post-test based on the standardized English examination papers administered at the school. The test papers were prepared by experienced subject teachers, ensuring alignment with the national English curriculum standards.

The reading comprehension section of the examination paper was adopted as the primary source of data for analysis. This section included multiple-choice items designed to assess key reading skills such as identifying main ideas, making inferences, understanding vocabulary in context, and analyzing text structure. The difficulty level of the reading comprehension questions followed the standardized test design, which incorporated a balance of easy, moderate, and challenging items to reflect students' varying proficiency levels.

By using standardized test papers as instruments, the study ensured both reliability and validity in measuring students' reading comprehension performance. The pre-test was conducted before the intervention (phonological awareness instruction for the experimental group and traditional instruction for the control group), while the post-test was administered after the intervention phase. The results of these tests provided the primary data to evaluate the effectiveness of phonological awareness training on enhancing students' reading comprehension proficiency.

*Validity and Reliability*

Validity refers to the extent to which an instrument measures what it is intended to measure. According to Mohaffyza et al. (2015), validity is one of the most important criteria in test construction and should be carefully considered to ensure that the data collected is accurate, relevant, and aligned with the research objectives. In this study, the reading comprehension test was not constructed by the researcher but was drawn from a standardized English examination paper officially prepared by experienced subject leaders and senior English teachers in Heilongjiang Province. These expert test setters, recognized for their extensive experience in English language assessment, ensured that the test content was aligned with the national curriculum standards and reflected an appropriate balance of easy, medium, and difficult items. Their involvement enhanced the authority and credibility of the test, thereby strengthening its content validity. Furthermore, test item validity was supported by the discrimination index, which identifies how well each item differentiates between high- and low-achieving students.

Reliability, in contrast, concerns the consistency, stability, and repeatability of an instrument's results. A reliable test should yield consistent outcomes when administered under similar conditions to the same group of participants. In this study, internal consistency was used to establish the reliability of the reading comprehension test. Cronbach's alpha coefficient was calculated to determine the degree of consistency among the test items, with higher values indicating stronger reliability. By relying on a standardized, professionally designed examination and verifying both validity and reliability through established statistical methods, this study ensured that the measurement of students' reading comprehension was both accurate and dependable.

**Result and Discussion***Result*

## 1. Descriptive Statistics and Paired-Samples t-Tests within the Control and Experimental Groups

Table 4.1

*Paired-Samples t-Tests within the Control and Experimental Groups*

Measure	Paired Variables (Mean±SD)			t	p
	Post-test	Pre-test	Difference		
EPreR vs. CPreR	18.409±4.326	18.273±3.446	0.136	0.186	0.853
EPostR vs. CPostR	22.636±5.026	18.841±3.477	3.795	4.488	0.000***

\* p<0.1 \*\* p<0.05 \*\*\* p<0.01

As shown in the table above, the baseline comparison before the intervention indicated no statistically significant differences between the experimental and control groups on the relevant indicators. The mean pre-reading score of the experimental group (EPreR) was  $18.409 \pm 4.326$ , while that of the control group (CPreR) was  $18.273 \pm 3.446$ . The mean difference between the two groups was only 0.136 points, which was not statistically significant ( $t = 0.186$ ,  $p = 0.853 > 0.05$ ). These results suggest that both groups were

homogeneous before the intervention, ruling out the possibility that baseline differences could have influenced the subsequent outcomes.

After the intervention, however, the experimental group significantly outperformed the control group, and the difference in improvement was highly significant statistically. The mean post-reading score of the experimental group (EPostR) was  $22.636 \pm 5.026$ , compared to  $18.841 \pm 3.477$  for the control group (CPostR), resulting in a mean difference of 3.795 points ( $t = 4.488, p < 0.001$ ). In terms of change from pre- to post-test, the experimental group's score increased from 18.409 to 22.636, representing a net gain of 4.227 points, whereas the control group's score increased only slightly from 18.273 to 18.841, a gain of 0.568 points. Thus, the improvement observed in the experimental group (4.227 points) was 3.659 points greater than that in the control group (0.568 points), further confirming the stronger positive effect of the intervention on the experimental group.

In summary, the results indicate that both groups were equivalent at baseline, but after the intervention, the experimental group achieved significantly higher scores and greater gains than the control group, with highly significant between-group differences. These findings demonstrate that the intervention effectively promoted improvement in the key performance indicators of the experimental group.

## 2. Descriptive Statistics and Independent-Samples *t*-Tests between the Control and Experimental Group

Table 4.2

*Independent-Samples t-Tests between the Control and Experimental Group*

	Grouped (Mean±SD)		<i>t</i>	<i>p</i>
	PC	PE		
Pre test	18.273±3.446	18.409±4.326	-0.164	0.870
Post test	18.841±3.477	22.636±5.026	-4.119	0.000***

\*  $p < 0.1$  \*\*  $p < 0.05$  \*\*\*  $p < 0.01$

As shown in the table above, independent-samples *t*-tests were conducted to compare the pre-test and post-test scores between the control group (CG) and the experimental group (EG). The results revealed that both groups had comparable baseline levels, while the experimental group showed a significantly greater improvement than the control group after the intervention.

The baseline comparison indicated no statistically significant difference in English reading performance between the two groups before the intervention. The mean Pretest score of the control group was  $18.273 \pm 3.446$ , and that of the experimental group was  $18.409 \pm 4.326$ , with the group difference being statistically nonsignificant ( $t = -0.164, p = 0.870 > 0.05$ ). These findings suggest that the two groups demonstrated good homogeneity in English reading ability prior to the intervention, thus eliminating the potential influence of initial disparities on the results.

After the intervention, the experimental group significantly outperformed the control group, and the difference in improvement magnitude reached a highly significant level. The mean Posttest score of the control group was  $18.841 \pm 3.477$  (an increase of 0.568 points from the Pretest), while that of the experimental group was  $22.636 \pm 5.026$  (an increase of 4.227 points). The improvement in the experimental group (4.227 points) was markedly higher than that in the control group (0.568 points), with a mean difference of 3.659 points. The between-group difference in post-test scores was highly significant ( $t = -4.119, p < 0.001$ ), confirming that the intervention exerted a more pronounced positive effect on the experimental group's English reading performance.

In summary, the two groups were equivalent at baseline, but after the intervention, the experimental group achieved significantly higher post-test scores and greater gains than the control group, with highly significant between-group differences. The intervention effectively enhanced English reading performance, particularly for students in the experimental group.

### Discussion

Pre- and post-test results showed that students receiving the phonologically conscious intervention made significant progress in reading comprehension, along with marked improvements in phoneme manipulation and ORF. The outcome pattern suggests that the intervention enhanced learners' underlying decoding processes, a cognitive foundation for successful text comprehension. When decoding becomes more efficient and less difficult, students can better allocate their attentional resources to meaning construction, which may explain the significant progress observed in the post-test in the experimental group.

The intervention was implemented according to a conceptual framework that emphasizes the interaction between PA, and ORF. Consistent with this framework, the improvement in ORF is aligned with the predictions of a two-pathway word recognition model. According to this model, increased automation of the sublexical pathway accelerates the conversion from orthographic input to phonological output, resulting in faster word recognition. As learners' decoding automation increases, cognitive load decreases, freeing up more energy for the higher-order integration processes required for comprehension. The fluency improvement revealed in this study provides strong evidence that the intervention facilitates the key mechanisms for improving students' reading abilities.

These findings are in accordance with previous research demonstrating that phonologically aware instruction can improve decoding efficiency and reading performance in English as a Foreign Language learners. For example, studies by Kim (2020) and Tong (2023) have shown that explicit training in phoneme segmentation, spelling, and manipulation significantly improves decoding fluency. The consistency of these findings with earlier empirical research suggests that phonologically aware instruction is an effective and replicable approach to supporting English as a Foreign Language reading development, even when learners have limited extracurricular exposure to English.

The contribution of this study lies in its instructional design, which integrates elements of phonics, the International Phonetic Alphabet (IPA), and analogical teaching strategies. By using learners' existing knowledge of pinyin and the structural correspondence between Chinese spelling and English letter-pronunciation patterns, this intervention builds a

linguistically meaningful bridge, thereby facilitating decoding. Vocabulary serves as the core carrier, enabling students to practice phoneme-grapheme associations in authentic vocabulary contexts. This approach, which combines natural speech with the International Phonetic Alphabet (IPA) and reinforces this through analogy and cross-linguistic scaffolded instruction, appears to improve decoding accuracy and fluency. As decoding becomes more automated, students are able to read coherent texts more easily, ultimately leading to a significant improvement in reading comprehension.

Overall, the observed progress in decoding, fluency, and comprehension forms a coherent pattern and provides empirical support for the theoretical pathway proposed in this study. The results indicate that interventions based on phonological awareness, supplemented by cross-linguistic analogy and fluency training activities, can effectively accelerate reading development in English as a foreign language learners. These findings are particularly relevant for Chinese high school students, as many still face difficulties in lower-level comprehension despite years of English instruction.

### **Theoretical and Practical Implication of the Study**

#### *Theoretical Implications*

The findings of this study contribute significantly to the theoretical understanding of reading development by reinforcing and extending established frameworks such as Rumelhart's (1977) interactive model, Stanovich's (1980) interactive-compensatory model, and Flavell's (1979) metacognitive theory. The significant correlations among PA, vocabulary size (VS), ORF, and reading comprehension (RC) reveal that reading is an interactive and dynamic process involving both bottom-up decoding and top-down comprehension mechanisms. Consistent with Rumelhart's model, effective reading requires the integration of phonological, lexical, and fluency-related information, while Stanovich's perspective is supported by the finding that improvements in fluency can compensate for lower-level decoding weaknesses, thus facilitating more efficient comprehension. Furthermore, the results extend metacognitive theory by showing that explicit PA instruction, supported by vocabulary expansion and fluency practice, enhances learners' ability to monitor, control, and evaluate their comprehension strategies. Learners with stronger phonological and lexical awareness demonstrate greater self-regulation and adaptability when faced with reading challenges, validating Flavell's view that metacognitive awareness is a core component of skilled reading. From a second language acquisition (SLA) perspective, the results lend empirical support to the transferability hypothesis of phonological processing (Perfetti, 1992; Koda, 2007). Despite Chinese being a logographic language, explicit PA-based instruction helped learners internalize English sound-symbol correspondences, thereby improving decoding and comprehension efficiency. This indicates that reading models developed in first-language contexts can be effectively adapted to EFL settings, bridging theoretical gaps between L1 and L2 reading development. Overall, this study reinforces the interactive and metacognitive nature of reading and extends existing theoretical frameworks to accommodate the linguistic and cognitive characteristics of Chinese EFL learners, offering a comprehensive perspective on how phonological, lexical, and fluency dimensions jointly shape second language reading proficiency.

### **Practical Implications for EFL Teachers and Students**

The findings of this study yield several practical insights for EFL teachers and students, particularly within Chinese senior high schools. The results underscore the importance of integrating PA into reading instruction, employing analogy-based and interactive learning strategies, emphasizing ORF as a bridge to comprehension, and designing integrated, exam-relevant reading programs. Explicit PA instruction was found to substantially enhance students' decoding accuracy, pronunciation, and word recognition—skills that are often overlooked in conventional reading lessons. Teachers are therefore encouraged to incorporate systematic PA activities, such as phoneme segmentation, onset–rime matching, and syllable blending, to strengthen sound–symbol connections and facilitate automatic word recognition, ultimately improving comprehension. Moreover, the use of analogy-based instruction—linking English phonetic rules with familiar Chinese linguistic systems such as Pinyin or radicals—proved particularly effective in helping learners internalize abstract phonological principles. Interactive approaches, including rhythm-based recitation, group oral reading, and peer feedback, further engage students and reduce reading anxiety, creating a supportive and collaborative learning environment. The improvement in oral reading fluency observed in this study highlights the need to regard fluency instruction as an integral component of comprehension rather than merely pronunciation practice. Through regular oral reading that focuses on appropriate pausing, stress, and intonation, learners can develop automaticity, strengthen syntactic and semantic awareness, and improve their silent reading efficiency. Importantly, students perceived that PA-based instruction not only enhanced their linguistic competence but also supported their exam preparation, demonstrating its compatibility with assessment-driven curricula. Consequently, English reading programs should adopt an integrated instructional approach that combines phonological training, vocabulary enrichment, and reading strategy instruction to cultivate both foundational and higher-order reading skills while ensuring alignment with exam-oriented educational contexts.

### **Conclusion**

This study demonstrated that integrating PA, vocabulary knowledge, and ORF within a structured instructional framework effectively enhances Chinese EFL learners' reading comprehension. Using the ADDIE model, the PA-based intervention systematically strengthened students' decoding, pronunciation, and fluency, leading to improved comprehension and greater reading confidence. The findings confirm that reading comprehension is an interactive process involving both lower- and higher-level skills, where gains in PA and ORF facilitate more efficient meaning construction and vocabulary expansion deepens understanding. By employing analogy-based and cross-linguistic strategies relevant to Chinese learners, the intervention proved both pedagogically effective and contextually adaptable. Overall, this study advances theoretical understanding of L2 reading development and provides practical guidance for teachers and curriculum designers seeking to improve English literacy outcomes in exam-oriented EFL contexts.

## References

- Abdulkader, F. A., Gundogdu, K., & Eissa, M. A. (2009). The effectiveness of a multiple intelligences-based program on improving certain reading skills in 5th-year primary learning disabled students. *Electronic Journal of Research in Educational Psychology, 7*(2), 673-690.
- Akyol, H., & Boyaci Altinay, Y. (2019). Reading difficulty and its remediation: A case study. *European Journal of Educational Research, 8*(4).
- Bai, J., Li, W., Yang, Y., Wu, J., He, W., & Xu, M. (2020). Cognitive correlates of reading fluency in Chinese school-aged children. *Frontiers in Psychology, 11*, 903.
- Butterfuss, R., Kim, J., & Kendeou, P. (2020). Reading Comprehension. *Grantee Submission*.
- Bu, W. (2018). On problems and countermeasures in oral English teaching in middle schools. *New Curriculum (Part 2), (3)7*, 7-18.
- Chen, H. (2016). Research on problems and countermeasures in oral English teaching in junior middle schools. *Xuezhou Magazine, 6*(13), 63-64.
- Denton, C. A., Fletcher, J. M., Taylor, W. P., Barth, A. E., & Vaughn, S. (2014). An experimental evaluation of guided reading and explicit interventions for primary-grade students at-risk for reading difficulties. *Journal of research on educational effectiveness, 7*(3), 268-293.
- De Vaus, D. (2001). Research design in social research.
- Ecalte, J., Dujardin, E., Gomes, C., Cros, L., & Magnan, A. (2021). Decoding, fluency and reading comprehension: Examining the nature of their relationships in a large-scale study with first graders. *Reading & Writing Quarterly, 37*(5), 444-461.
- Gholami, M., Shirazi, T. S., Nikookar, N., & Rahimi, A. (2016). Comparison of effectiveness of phonetic intervention, holistic intervention and mixed intervention on the rate and accuracy of reading skills of children with reading difficulty in grade 2. *The IOAE Journal, 7*(1), 270-276.
- Groen, M. A., Veenendaal, N. J., & Verhoeven, L. (2019). The role of prosody in reading comprehension: Evidence from poor comprehenders. *Journal of Research in Reading, 42*(1), 37-57.
- Hsu, L. S. J., Chan, K., & Ho, C. S. H. (2023). Reading fluency as the bridge between decoding and reading comprehension in Chinese children. *Frontiers in Psychology, 14*, 1221396.
- Horowitz-Kraus, T., & Finucane, S. (2016). Separating the different domains of reading intervention programs: A review. *SAGE Open, 6*(2), 2158244016639112.
- Jamshidifarsani, H., Garbaya, S., Lim, T., Blazevic, P., & Ritchie, J. M. (2019). Technology-based reading intervention programs for elementary grades: An analytical review. *Computers & Education, 128*, 427-451.
- Jones, E., Larsen, R., Sudweeks, R. R., Young, K. R., & Gibb, G. S. (2018). Evaluating paraeducator-led reading interventions in elementary school: A multi-cutoff regression-discontinuity analysis. *Journal of Research on Educational Effectiveness, 11*(4), 507-534.
- Kim, Y. S. G., Quinn, J. M., & Petscher, Y. (2020). Reading prosody unpacked: A longitudinal investigation of its dimensionality and relation with word reading and listening comprehension for children in primary grades. *Journal of Educational Psychology*. doi:10.1037/edu0000480
- Levlin, M., & Nakeva von Mentzer, C. (2020). An evaluation of systematized phonics on reading proficiency in Swedish second grade poor readers: Effects on pseudoword and sight word reading skills. *Dyslexia, 26*(4), 427-441.

- Liu, J. L. (2018). Factors affecting teaching speaking in high school. *Teaching Research and Practice, 9*(1), 34-35.
- Mar, R., Djikic, M., & Oatley, K. (2008). Effects of reading on knowledge, social abilities, and selfhood: Theory and empirical studies. In *Directions in empirical literary studies* (pp. 127-137). John Benjamins Publishing Company.
- Molenda, M. (2003). In search of the elusive ADDIE model. *Performance improvement, 42*(5), 34-37.
- Mohaffyza, M., Sulaiman, N., Lai, C. S., & Salleh, K. M. (2015). Measuring the Validity and Reliability of Research Instruments. *Procedia – Social and Behavioral Sciences, 204*, 164–171. <https://doi.org/10.1016/j.sbspro.2015.08.129>
- Tong, X., Chiu, M. M., & Tong, S. X. (2023). Synergetic effects of phonological awareness, vocabulary, and word reading on bilingual children’s reading comprehension: A three-year study. *Contemporary Educational Psychology, 73*, 102153.
- Xiao, Q. L. (2017). How to communicate language teaching become acceptable in secondary school in China. *The Internet TESL Journal, 6*(10), 200-212.
- Wang, R. M., & Chen, X. Z. (2023). Exploration and inspiration of CET score on college English teaching. *Modern English, 23*(1), 13-16.
- Zhang, D., Lin, C. H., Zhang, Y., & Choi, Y. (2019). Pinyin or no pinyin: Does access to word pronunciation matter in the assessment of Chinese learners’ vocabulary knowledge? *The Language Learning Journal, 47*(3), 344-353.
- Zhang, Y. J., & Lee, S. (2017). The relationship among English phonological awareness, reading ability and vocabulary size of Chinese high school students with learning difficulties. *현대영어교육, 18*(3), 25-45.