

Project Title: Reducing early literacy differences in preschool children from low-SES families: The effects of an early metalinguistic intervention

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Final Report

by

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1 Abstract

This study developed and investigated the effects of an early metalinguistic intervention program called “Joy of Learning Literacy (Jolly)” on the language and reading skills of Chinese children from families with low socioeconomic status (SES) in Hong Kong. A total of 303 third grade kindergarteners completed pretests and posttests on language and reading skills in Chinese and English. Between the two tests, the intervention group received 18 Chinese lessons and 12 English lessons, whereas the control group received no language-related intervention. Controlling for parent education and child gender, age, and pretest performance, ANCOVAs showed that the intervention group (a) performed significantly better in posttests on phonological awareness and morphological awareness in Chinese, and phonological awareness, vocabulary knowledge, and word reading in English, compared with their low-SES counterparts in the control group, and (b) performed significantly better in posttests on phonological awareness and vocabulary knowledge in English, compared with their middle-SES counterparts in the control group. Cluster analysis further revealed three subgroups among low-SES children regarding language skills. Comparisons of these subgroups showed that children with lower language skills prior to participation in the intervention exhibited greater improvement regarding Chinese and English language skills. These findings highlight the potential benefits of an effective early metalinguistic intervention program for addressing the reading achievement gap of kindergarten children from low-SES and middle-SES families in Hong Kong. These results also increase public awareness of the influence of poverty on child language and literacy development and demonstrate ways for helping low-SES children and their families.

2 Keywords (in alphabetical order)

Chinese and English learning, early metalinguistic intervention, kindergarten children, language and reading skills, low-SES families

3 Introduction

Literacy is vital to the academic achievement of children throughout their school years. However, most children from families with low socioeconomic status (SES) are at risk of making poor progress in developing cognitive and language skills, which adversely affects later academic achievement. The academic achievement gap between disadvantaged and advantaged children seems to play a prominent role in the intergenerational transmission of poverty. The academic inequalities linked with low SES begin in early childhood and may persist or even worsen over time. More importantly, failure to develop reading and writing skills may have various negative effects on young children. The inability to communicate and learn effectively is associated with social and emotional behavioral problems, which may prompt students to withdraw from educational environments and therefore lack vital teacher–student interactions. Studies on children with slow development have demonstrated that those from low-SES backgrounds tend to be at greater risk of making poor progress in early literacy learning, with negative effects on their ensuing academic progress (Hart & Risley, 1995; Liu, Chung, & McBride, 2016). A low-SES family background may be a major factor contributing to such slow progress partly because of parent literacy levels and behaviors.

Increasing evidence suggests that kindergarten children from low-SES backgrounds in Hong Kong tend to develop language and literary skills at a slower rate than their middle-SES peers (Chung, Liu, McBride, Wong, & Lo, 2017; Liu et al., 2016). Therefore, in the current study, we aimed to develop and implement an early literacy intervention program based on home-school collaboration and education for Chinese kindergarten children with low-SES backgrounds.

4 Literature Review

4.1 Language development of young children

Language development has a profound effect on the future growth of young children (Chung et al., 2017; Duncan, Brooks-Gunn, & Klebanov, 1994). Poor progress in early language skill development may negatively affect a child's academic achievement (Moffitt et al., 2011; Reynolds, Temple, White, Ou, & Robertson, 2011). Indeed, early language development is a key predictor of cognitive functioning, behavioral adjustment, and academic achievement (Teale & Sulzby, 1986; Wells, 1985).

In Hong Kong, children begin to read at the age of approximately 3 years and learn both Chinese and English throughout their school years. Competence specifically in Chinese and English language and literacy skills is key for early learners in Hong Kong because it constitutes two thirds of the core subjects in the Hong Kong education system and is therefore practically linked to securing desirable jobs in the future. Because children vary in their language abilities from a young age, identifying optimal methods for fostering child language development is imperative. Notably, Chinese differs from English in various aspects that are relevant to literacy acquisition, such as phonology, visual orthography, and morphology. Chinese is a morphosyllabic writing system, in which each character, the basic unit of writing, represents both a morpheme (meaning unit) and a syllable. The majority of Chinese words are compounded from two or more morphemes, with a relatively high number of homophones. Therefore, an integrated intervention program involving specific training of key language skills such as morphological structural awareness and homophone sensitivity morphemes may facilitate the acquisition of Chinese and English literacy.

4.2 Socioeconomic status and childhood language development

SES is commonly associated with the cognitive ability, language skills, and reading academic performance of young children (Chung et al., 2017). Low-SES families are categorized

as having low income, which is often associated with parents who have received relatively little education. The children from these families are often disadvantaged in terms of having lower academic achievement, fewer employment opportunities, and limited access to public services and social support. Limited academic skills, free time, and awareness of the value of parental input are also characteristics of such families. Moreover, these families experience greater difficulty in acquiring access to literacy materials and activities, which affects the language and literacy development of their children (Lundberg, Larsman, & Strid, 2012; Rodriguez et al., 2009). This premise implies that children from low-SES backgrounds are at risk of experiencing problems in language acquisition and the development of literacy skills in early life. Considerable evidence has also indicated that young children with low-SES backgrounds tend to develop slower than their middle-SES counterparts in terms of cognitive, general language, and literacy abilities (Korat, 2005; Noble, Farah, & McCandliss, 2006; Qi, Kaiser, Milan, & Hancock, 2006; Reynolds & Fish, 2010). A probable reason for this is that compared with children from middle-SES families, those from low-SES families tend to have relatively limited access to resources, receive less parental support and care, and have parents who are less likely to engage with them or provide them with educational experiences. Therefore, the discrepancy between children from middle-SES and low-SES backgrounds regarding language skills and literacy may widen over time (Walker, Greenwood, Hart, & Carta, 1994). Family-led approaches to enhance the language skills and literacy of kindergarten children from low-SES families have received an increasing amount of attention. Some studies have also reported positive influences of parental engagement in child learning activities on the language and literacy development of children (Foster & Miller, 2007; Roberts, 2008; Sénéchal, 2006). As teachers (Wagner & Clayton, 1999), parents positively influence the language and literacy acquisition of their children. Home-school collaboration may be considered

a more effective means of promoting child language and literacy development. Therefore, the SES of a child's family is closely related to their language development.

4.3 Metalinguistic skills and childhood language development

Phonological awareness refers to the ability to identify and manipulate units of sound. Phonological awareness, particularly phoneme awareness, is the ability to predict reading acquisition robustly across alphabetic languages, including but not limited to English (Goswami & Bryant, 1990; Rack, Snowling, & Olson, 1992; Shankweiler & Fowler, 2004). From a meta-analysis of 235 studies, Melby-Lervag, Lyster, and Hulme (2012) concluded that phonemic awareness is a critical determinant of reading development because it reflects the lexical organization of phonological representations, which in turn determines success when learning to read. Phonological awareness is certainly a causal catalyst in learning to read in many alphabetic writing systems (Wagner & Torgesen, 1987) because it helps children to understand the alphabetic principle that letters in words are represented by sounds.

However, unlike English, for which reading involves blending letter sounds at the phoneme level, the recognition of Chinese characters requires the mapping of spoken words at the syllable level to written Chinese characters to link characters with their respective "sounds" (McBride-Chang & Ho, 2005). Thus, syllable awareness may be the critical determinant for reading Chinese (McBride-Chang, Bialystok, Chong, & Li, 2004). The role of phonological awareness in the Chinese language is somewhat unclear. Numerous studies have supported the independent and consistent relation between phonological awareness and word-level reading across scripts (e.g., Bus, & van IJzendoorn, 1999; Shu, Peng, & McBride-Chang, 2008; Wagner et al., 1997; Wagner & Torgesen, 1987). From a longitudinal study of 182 children, Catts and colleagues (2006)

discovered that kindergarten children who had relatively poor reading comprehension also had poorer phonological awareness than peers with adequate reading comprehension.

Phonological skills have long been proven to be transferable between alphabetic languages (Comeau, Cormier, Grandmaison, & Lacroix, 1999; D'Angiulli, Siegel, & Serra, 2001; Durgunoğlu, Nagy, & Hancin-Bhatt, 1993). For children learning English as a second language (L2) with Chinese as their first language (L1), many studies have reported a significant relationship between Cantonese Chinese (L1) rhyme detection and English (L2) phonological and reading measures (Gottardo, Yan, Siegel, & Wade-Woolley, 2001). Cross-language transfer of phonological awareness from English (L2) to Chinese (L1) regarding other aspects of language have also been demonstrated: L2 instruction focusing on listening, speaking, and reading significantly enhances children's L1 Mandarin Chinese phonological awareness and skills with pinyin (a Mandarin phonetic system; Chen, Xu, Nguyen, Hong, & Wang, 2010). The surprising bidirectional transfer of phonological skills between Chinese and English seems quite robust (e.g., Keung & Ho, 2009; Yeong & Liow, 2012). Although phonological units encoded in orthography are likely more fine-grained in English (phonemes) than in Chinese (syllables), nonetheless, phonological skills seem to be transferable across these languages (Perfetti, Zhang, & Berent, 1992). If this concept is further studied and defended, a universal phonological core intrinsic to reading development across orthographies may increase the necessity of promoting the role of phonology in language development, especially in multilingual settings.

Morphological awareness refers to the ability to recognize and manipulate the meaning structure of language. Relevant research has consistently demonstrated that morphological awareness has a strong influence on the reading processes in English (Ben-Dror, Bentin, & Frost, 1995; Casalis & Louis-Alexandre, 2000) and Chinese (McBride-Chang et al., 2008; Tong,

McBride-Chang, Shu, & Wong, 2009). As mentioned, because Chinese is a logographic and morphosyllabic writing system (DeFrancis, 1984), it differs remarkably from English in terms of both linguistic and structural features. In Chinese, each graphic unit is a character representing a syllable and morpheme (DeFrancis, 1984; Mattingly, 1992; Perfetti & Zhang, 1995). Chinese characters are visually more complex than letters of the English alphabet, with stroke patterns confined to square-shaped forms. Approximately 80% of semantic and phonetic compound characters consist of semantic and phonetic radicals. The semantic radicals provide meaning cues (e.g., 燈 (lamp) because 火 (fire) was required to light an oil lamp in the past) whereas phonetic radical signifies sound cues for the character (e.g., 登 /dang1/, meaning “climb”). Unlike English, Chinese does not represent phonemes or have systematic grapheme-to-phoneme relationships. Therefore, syllables in Chinese are more prominent, whereas phonological units and phonemic awareness are less critical for Chinese than for English (McBride-Chang et al., 2008; Yeung, Chen, & Werker, 2013). Many syllables are composed of two or more homophones with different meanings (Zhou, Zhuang, & Yu, 2002). Because nearly 4500 characters are commonly used in everyday Chinese, many phonological and orthographical units must be stored and retrieved from lexical memory (Liu, Chuang, & Wang, 1975). Moreover, phonetic radicals are not always reliable predictors of the pronunciation of a character. Only 40% of characters can be directly decoded from their respective phonetic radical by using orthography – phonology correspondence rules (Shu, Chen, Anderson, Wu, & Xuan, 2003). Semantic radicals appear to be generally more reliable than phonetic radicals because Chinese characters have varying degrees of semantic and phonological regularity and consistency. With over 800 phonetic radicals (DeFrancis, 1984) and around 200 semantic radicals (Feldman & Siok, 1999) with different degrees of positional,

semantic, and phonological regularities for radicals; the orthographic rules in Chinese are visually compact and relatively complicated. Because learning Chinese characters tends to rely heavily on relatively arbitrary associations between print and sound, the knowledge of the reader regarding the internal structures and positions of radicals within characters plays a key role in reading and writing Chinese.

Another aspect of morphological awareness in Chinese involves the number of homophones and homographs. Chinese has many syllables that have more than one homophone, and each syllable denotes a different meaning (Packard, 2000; Zhou et al., 2002). For example, the syllable /hung4/ has the different meanings of “red,” “bear,” “male,” and “flood.” Furthermore, a morpheme (or character) can be combined with two or more morphemes to create compound words in Chinese (Packard, 2000). For example, the morpheme 火 (fire) can be compounded with other characters to form several new words, such as 火災 (fire hazard), 火爐 (furnace), and 火石 (flint). These words all have the fire morpheme and are therefore morphologically related. Thus, morphological skills, or the ability to manipulate morphemes and employ rules of word formation, have a profound influence on reading and writing Chinese (e.g., Kalindi & Chung, 2018; McBride-Chang et al., 2008; Shu, McBride-Chang, Wu, & Liu, 2006). Many Chinese words consist of two or more syllables with meaningful morphemes; thus, morphological awareness has been identified as a strong concurrent and longitudinal predictor for the reading and spelling of Chinese words in children (Tong et al., 2009; Yeung et al., 2013).

Moreover, Chinese characters have unique features in terms of their orthographic structure. The English alphabet comprises only 26 letters, whereas Chinese characters consist of 620 different stroke patterns (sometimes called radicals). Chinese characters contain much more visual information than do English words (Hoosain, 2013). In particular, the visual–spatial configuration

of the Chinese language contrasts with the linear structure of English. Each character is a salient perceptual unit that differs from all others in terms of the number of strokes, number of radicals, and spatial configuration. In contrast to English, in which word length is a visual cue, in Chinese, characters are visually distinguishable only by individual strokes, with all characters occupying the same amount of space. Therefore, visual-orthographic skills may be more critical to learning Chinese characters than words written in an alphabetic system (Huang & Hanley, 1995; Leck, Weekes, & Chen, 1995; Tzeng & Wang, 1983). In Chinese, characters are composed of different stroke patterns that provide rich visual-spatial properties (e.g., 一, |, 丿, ㇏, ㇚) (Chen & Kao, 2002; Gao & Kao, 2002). These stroke patterns are the components used to create radicals that can be combined to form Chinese characters, and they provide a perceptual aspect of orthographic processing (Shen & Bear, 2000). Traditional characters, which are regularly used in Hong Kong, require even more stroke patterns than do the simplified characters used in mainland China. For example, the character 體 (/tai2/, meaning “body”), has 23 strokes in the traditional form, whereas its simplified form 体 consists of seven strokes. Chinese characters can be formed from simplified characters with one radical or compound characters with multiple radicals (Huang, 2005; Lin, 2006).

Emerging evidence from cross-sectional and interventional studies suggests that the metalinguistic skills (i.e., phonological, orthographic, and morphological awareness) individually and interactively contributes to the development in Chinese and English language skills in children (Chung, Ho, Chan, Tsang, & Lee, 2011; Chung, Lam, & Cheung, 2018; Chung, Tong, & McBride-Chang, 2012; Ehri, 2014; Good, Lance, & Rainey, 2015; Karami, Abbasi, & Zakei, 2013; Packard et al., 2006; Tong & McBride-Chang, 2010). Some studies have also suggested that directly teaching vocabulary and oral language is crucial for language development in children (Mayer &

Motsch, 2015; Torgesen, Wagner, Rashotte, Burgess, & Hecht, 1997). Therefore, by extending relevant research, the newly developed intervention program in the current study was designed to develop the phonological, orthographic, and morphological awareness of children as well as to improve their vocabulary knowledge and oral language abilities.

5 Study Theoretical Framework

5.1 Early intervention on child language

Early language and literacy intervention has been recognized by Western communities as one of the most cost-effective means of preempting intergenerational poverty (Duncan, Ludwig, & Magnuson, 2007). The Head Start program in the United States, for example, has been demonstrated not only to increase the benefits children acquire from education but also reduce their likelihood of grade repetition, crime involvement, and welfare dependency (Ludwig & Phillips, 2008). With the prevalence of poverty in Hong Kong, evaluating a locally derived intervention program that targets language learning would help policy makers to assess the feasibility of ameliorating difficulties related to language learning and literacy and the negative effects of poverty by addressing educational inequality at an early stage of child development.

The majority of literacy programs for young learners have demonstrated positive effects of metalinguistic training on the literacy acquisition of English-speaking children from families with low SES. However, most of these programs were not designed to address the needs of Chinese children and their families. For example, compared with Western parents, Chinese parents may prefer to support their children's learning with standard drill approaches and more formal, direct, sequential, and systematic teaching than through informal and discovery-based approaches. Formal education begins much earlier in Hong Kong than in Western countries. Children educated in China begin to read and write at the age of 3.5 years, indicating that Chinese parents may have

less time than Western parents to teach their children to read and write at home before they attend school. As aforementioned, the Chinese language differs from English in various aspects of phonology, visual orthography, and morphology that are relevant to literacy acquisition. Because Chinese words are compounded from two or more morphemes, a thorough understanding of morphological structures and homophone-sensitive morphemes may facilitate literacy acquisition (Tong et al., 2009). In Chinese, approximately 80%–90% of characters are ideophonic compounds, which consist of semantic and phonetic radicals. Generally, semantic and phonetic radicals provide a character with semantic category and sound cues, respectively. Moreover, most radicals in a character present habitual positions. Thus, identifying the correct orientation of orthographic units and having an adequate understanding of pronunciation and meaning cues may facilitate vocabulary expansion and improvement in reading comprehension. Research on literacy acquisition among Chinese children has revealed that phonological awareness (McBride-Chang & Ho, 2000), orthographic skills (Ho, Yau, & Au, 2003), morphological awareness (McBride-Chang, Shu, Zhou, Wat, & Wagner, 2003), vocabulary (Shu et al., 2006), and oral language skills (Liu et al., 2010) are crucial contributors to literacy acquisition. Considering the significant contribution of these skills to literacy acquisition, an early intervention focusing on these skills may facilitate the development of metalinguistic skills and literacy of Chinese children from low-SES families.

A considerable amount of research conducted on parental engagement in literacy programs has further demonstrated the significance of parental involvement in delivering interventions for English-speaking children at risk of developing literacy difficulties. Relevant studies have also reported that early education intervention programs for children from disadvantaged backgrounds, such as Head Start (Currie, 2001; Fantuzzo, Perry, & McDermott, 2004), Parents as Teachers (Wagner & Clayton, 1999), and Instruction for Parents of Preschool Youngsters (Baker,

Piotrkowski, & Brooks-Gunn, 1999), positively influence child language and literacy acquisition. The reason behind this influence is that such intervention programs promote parental involvement that support and improve child literacy. Positive parent–child relationships may be fostered through quality time spent by parents with their children. Literacy programs may also improve the social and behavioral skills of children because teachers and parents may discuss the child’s behaviors at home and in school and collaborate to improve the social functioning and address the problem behaviors of the child (Rimm-Kaufman, Pianta, Cox, & Bradley, 2003; Supplee, Shaw, Hailstones, & Hartman, 2004).

5.2 The present study

The current project primarily aimed to develop, implement, and evaluate an early intervention program to facilitate literacy acquisition among Chinese kindergarten children from low-SES families. We incorporated several core teaching components of metalinguistic skills, including oral language abilities, phonological skills, morphological skills, orthographic skills, and vocabulary knowledge, all of which are considered critical to learning Chinese and English. The first objective of this study was to investigate the changes in the metalinguistic and literacy skills of children through interventions. The second aim was to examine the metalinguistic profile of kindergarten children from low-SES families, emphasizing the characteristics of low-SES children and how these metalinguistic skills are associated with reading Chinese and English. Other studies (e.g., Chung, Liu, McBride, Wong, & Lo, under review; Liu et al., 2016) have discovered that the reading and spelling abilities of Chinese-speaking kindergartner from low-SES families are related to and influenced by the phonological awareness, morphological awareness, orthographic awareness, vocabulary knowledge, and oral language abilities. Therefore, teaching these skills may improve the metalinguistic skills and literacy of Chinese children. We anticipated the following

results: (a) children from low-SES families would perform significantly better than their low-SES peers after completing the intervention, (b) children from low-SES families would exhibit worse performance than their middle-SES counterparts in terms of metalinguistic skills and literacy prior to the intervention but would demonstrate significantly improved performance after completing the intervention, (c) some subgroups would form among children from low-SES families in terms of language skills, which would lead to differences in reading skills, and (d) children in different subgroups would respond differently to the intervention.

6 Methodology

6.1 Participants

A total of 303 third grade (K3) kindergarten children and their parents from 13 local kindergartens in Hong Kong participated in this study. Based on median monthly household income (Census and Statistics Department, 2016), we first stratified the 18 geographic districts of Hong Kong into high- (ranging from HK\$ 29,000–40,000 or approximately US\$ 3,718–5,128), middle- (ranging from HK\$ 24,200–28,000 or approximately US\$ 3,103–3,590), and low- (ranging from HK\$ 19,000–23,000 or approximately US\$ 2,436–2,949) socioeconomic strata. We then randomly telephoned kindergartens (using publicly available contact information) until nine kindergartens in low-SES districts and four kindergartens in middle-SES districts agreed to recruit families for the study. Through these participating kindergartens, we sent invitation letters and consent forms to all K3 children. After written informed consent had been obtained from parents, our final sample included 215 and 88 families from low-SES (nine kindergartens) and middle-SES (four kindergartens) districts, respectively. Of the 215 low-SES children, 120 were randomly assigned to the intervention group with home-school collaborative and school literacy programs. The remaining 95 children from low-SES families and 88 children from middle-SES families were

assigned to the control group without language-related intervention program. Descriptive information of participants is presented in Appendix E.

6.2 Measures

Vocabulary knowledge was measured using the 60-item and 72-item receptive vocabulary tasks for Chinese and English, respectively, which were translated and adopted from the third edition of the Peabody Picture Vocabulary Test (Dunn & Dunn, 1997). Each item consisted of four black-and-white illustrations arranged on a picture plate. After being presented with the picture plate, children were asked to select the picture that best represented the connotation of a stimulus word that was orally provided by the administrator. Children were asked to answer all items. One point was awarded when children selected the correct picture, and zero points were given for an incorrect response or no response.

Phonological awareness was measured using the 51-item (McBride-Chang et al., 2008) and 8-item (Yeung & Ganotice, 2014) syllable deletion tasks for Chinese and English, respectively. These tests consisted of two-syllable and three-syllable words. After hearing the words, children were asked to delete a single syllable from each word and then read it aloud (e.g., for the English item “please read /beft/ without /t/,” the answer would be “/bef/”; for the Chinese item “please read 檸檬茶 (lemon tea) without the word 茶 (tea),” the answer would be “檸檬 (lemon)”). Based on the level of difficulty, the items on the Chinese phonological test were grouped into six blocks, each of which consisted of 7–10 items. If a child failed on six or more items within one of the first three blocks, or failed on four or more items within one of the last three blocks, then the whole task was terminated. Children were asked to answer all items in the English phonological test. One point was awarded when children pronounced the word correctly, and zero points were awarded for an incorrect response or no response.

Chinese morphological awareness was measured using the 48-item morphological construction test (McBride-Chang et al., 2003). A short scenario was orally presented to children before they were asked to construct new words for concepts or objects based on the scenario (e.g., for the item “A box that holds letters is called a letterbox. What do we call a table that holds letters?” the newly constructed word would be “lettertable”). Items were organized into eight blocks based on the level of difficulty, each of which consisted of five to seven items. For the initial five blocks, if a child failed on four or more items within one block, then the whole test was terminated. If the child successfully reached block 6, then the next task would be to complete the remaining three blocks regardless of errors. One point was awarded for a correct response and zero points were awarded for an incorrect response or no response.

Word reading ability was measured using the 70-item and 80-item word reading tasks for Chinese and English, respectively. The Chinese word reading task consisted of 30 single-character and 40 two-character words of increasing difficulty that were adopted and modified from the HKT-P (II) to suit the reading ability of children enrolling in kindergartens in Hong Kong (Chung & McBride-Chang, 2011). The English test consisted of 80 words derived from textbooks commonly used in kindergartens in Hong Kong (McBride-Chang & Treiman, 2003). For both reading tasks, children were asked to read aloud each word individually from the beginning of the test at their own pace. One point was awarded when children pronounced the word correctly and zero points were awarded for an incorrect response or no response.

Demographic and socioeconomic information was provided by parents of all participating children, who were invited to complete a questionnaire comprising questions concerning SES information, such as parent education, occupation, and income level as well as the educational

experiences of their children, and parents' engagement in parent-child interactive literacy activities.

6.3 Intervention

We designed the program to teach five language skills: (a) phonological awareness (Chinese and English), (b) orthographic awareness (Chinese), (c) morphological awareness (Chinese), (d) vocabulary knowledge (Chinese and English), and (e) oral language skill (Chinese and English). Our final language intervention program consisted of 18 and 12 sessions for Chinese and English, respectively. Each session had a duration of 30 minutes, and the program was delivered by experienced kindergarten teachers twice per week over a period of 15 weeks. In other words, one Chinese lesson and one English lesson were conducted in the first 12 weeks, and Chinese lessons were conducted twice in the last 3 weeks.

Training of metalinguistic skills occupied approximately 70% (11 lessons) and 50% (5 lessons) of the Chinese and English programs, respectively. Specifically, training of phonological awareness for Chinese focused on syllabic ability and use of spoken words, and that for English emphasized the concept of constituent syllables, rhyme, and onset words. For Chinese, training of orthographic awareness focused on semantic identification of radicals (e.g., 口 meaning mouth, 手 meaning hand) and judgment of radical positioning (e.g., left-to-right, top-to-down, outside-to-inside, and independent), while training of morphological awareness helped children to distinguish between the meanings of different morphemes and use morpheme words.

The current intervention program was also designed to directly improve children's vocabulary knowledge and oral language abilities, both of which have been proven to be crucial to the development of Chinese and English reading abilities in young children (McBride-Chang et al., 2008; Lonigan, Schatschneider, & Westberg, 2008). Vocabulary knowledge and oral language

training were quite similar for Chinese and English. New vocabulary items were taught and practiced repeatedly through multiple well-designed activities and games, such as storytelling, matching games, and magic spell songs. Moreover, age-appropriate games such as role-playing and sentence-making games were also utilized to develop the oral listening and communication skills of the children.

Five key pedagogical features were used in the intervention design: child-centered learning, diversified learning activities, play-based learning, multisensory teaching approach, and thematic approach. In particular, the Chinese sessions were designed under one integrated theme of “Happy Circus”, whereas the English sessions were developed based on six topics: human body parts, shapes, transportation, animals, sports, and bingo. In accordance with these specific themes, rhyming and onset words were also introduced through games. All sessions included (a) a 5-min introduction/warm-up and revision session, (b) a 20-min main activity involving such activities as storytelling, singing, word games, and character puzzle games, and (c) a 5-min conclusion. Additionally, to assist teachers in monitoring the learning progress of the children, review exercises were conducted during the seventh and sixteenth sessions for Chinese and during the sixth and twelfth sessions for English. Outlines of the Chinese and English sessions are provided in Appendix A and B, respectively. Furthermore, take-home activities were also designed for both Chinese and English sessions with the aim of promoting parental involvement in children’s language learning and helping children to apply knowledge and skills learned in school.

Appendix C and D present some exemplary sessions for Chinese (second session) and English (third session), respectively. For example, in the introduction phase of the third English session (under the theme of human body parts), the teacher and all children sat in a circle and sang a “hello hello” song together. In the main activity phase, the teacher used a monkey doll to

introduce body parts (e.g., teeth and hair) and some verbs (e.g., brush and wash). Then, the teacher presented some examples of full sentences by combining the words learned: “I brush my teeth,” and then together with possible question: “What can you do? I can brush my teeth.” After that, children were divided into small groups to practice the words and sentences in a card game. Finally, in the conclusion phase, the teacher used picture cards and the magic spell sentences (e.g., “good bye Oreo, good bye Oreo,” which had a repetition of the sound “o”) to reinforce the new knowledge and sang a “Goodbye” song to conclude the lesson.

7 Data Collection and Analysis

After parental permission, all participating children completed pretests (November–December, 2016) and posttests (May–July, 2017) approximately 5 months apart on phonological awareness, morphological awareness, vocabulary knowledge, and reading in both Chinese and English. For both pretests and posttests, children were tested individually within a 60-min session during class time. To prevent fatigue, short breaks were scheduled between tests. All tests were administered by trained research assistants and college student assistants, following standard procedures. Moreover, through questionnaires, parents provided demographic information regarding their child and family, including the child’s gender and age, parents’ education level, and monthly household income. As a token of appreciation, each child received a gift of HK\$10 (or about US\$1) after completing the tasks at each test, and each parent received a supermarket coupon of HK\$50 (or about US\$6) after completing the whole study. Moreover, 10% of the 30 language sessions were randomly selected from each school in the intervention group to evaluate the treatment fidelity of the intervention program. The results revealed that the average fidelity of the selected sessions was 98%, indicating that session activities were appropriately delivered and session objectives were generally achieved.

In response to our multiple research objectives, analyses were conducted in three stages. In stage 1, we focused on the effectiveness of the intervention among children from low-SES families. Using SPSS 22.0, we conducted a series of analyses of covariance (ANCOVAs) on children from low-SES families in the intervention and control groups to identify differences in posttest scores for the different language tests. In stage 2, we performed ANCOVAs to further evaluate the effectiveness of the intervention by comparing children from low-SES families in the intervention group with children from middle-SES families in the control group in terms of posttest scores for language skills. In stage 3, we performed a series of cluster analyses using the *R* project with K-means techniques to identify potential subgroups among children from low-SES families with respect to pretest scores for language skills. Differences were also examined among identified subgroups regarding reading skills and differences after the intervention.

8 Results and Discussions

Appendix F presents the results of the ANCOVAs for children from low-SES families in the intervention and control groups. First, after controlling for children's gender and age and parent's education level, the two groups did not exhibit differences with respect to Chinese and English language and reading skills in the pretests, suggesting no predetermined difference between the groups. Then, after controlling for parent's education level and children's gender, age, and pretest scores, the children in the intervention group exhibited significantly better performance than their low-SES counterparts in the control group on posttests with respect to phonological and morphological awareness in Chinese and phonological awareness, vocabulary knowledge, and word reading in English. Focusing on the effect sizes, the intervention and control groups accounted for 28% (phonological awareness), 15% (vocabulary knowledge), and 11% (word reading ability) of the variances in multiple English skills, indicating medium to large effect sizes

(η^2). Moreover, the strength of the correlation between the intervention and control groups for Chinese skills was slight but significant, accounting for 6% (phonological awareness) and 7% (morphological awareness) of variances and indicating small to medium effect sizes. Therefore, the results in stage 1 supported the effectiveness of our intervention program on improving the language and reading skills of children from low-SES families.

Appendix G presents the ANCOVA results for children from low-SES families in the intervention group and children from middle-SES families in the control group. We first analyzed the differences between the two groups regarding their language skills in the pretests. The results revealed that after controlling for children's gender and age and parent's education level, the two groups did not exhibit significant differences in pretest scores for Chinese and English language and reading skills, with the exception of English word reading skills, for which children from low-SES families in the intervention group had significantly lower scores than children from middle-SES families in the control group. After controlling for parent's education level and children's gender, age, and pretest scores, children from low-SES families in the intervention group performed significantly better than their counterparts from middle-SES families in the control group on posttests for phonological awareness and vocabulary knowledge in English. In terms of effect size (η^2), the intervention and control groups accounted for 21% and 27% of variances in English phonological awareness and English vocabulary knowledge, respectively. Thus, the results in stage 2 further supported the effectiveness of our intervention program on improving the language and reading skills of children from low-SES families.

Appendix H presents the results of a cluster analysis on children from low-SES families across the intervention and control groups. Three subgroups were identified according to pretests scores:

- Group 1: high scores for all language skills;
- Group 2: low scores for all language skills;
- Group 3: high scores for English vocabulary knowledge but low scores for all other skills.

Further comparisons of these three subgroups in terms of reading skills revealed that Group 1 performed significantly better than the other two groups in Chinese word reading, whereas the three subgroups did not differ significantly in English word reading. Therefore, our results indicated that all Chinese language skills (i.e., phonological awareness, morphological awareness, and vocabulary knowledge) are critical for Chinese word reading, whereas English phonological awareness and English vocabulary knowledge likely play crucial roles in English word reading abilities.

Notably, of the children who participated in our intervention programs, those in Group 2 (low scores for all language skills) demonstrated the most substantial improvement in both Chinese and English vocabulary knowledge, and those in Group 3 (high scores for English vocabulary knowledge but low scores for all other language skills) demonstrated the greatest improvement in both Chinese and English phonological awareness. These findings further support the effectiveness of our intervention program for fostering children's language development, especially in children with relatively low language skills prior to participation in the intervention.

9 Conclusions and Recommendations

By extending theoretical and empirical research on early language and reading interventions, the present study developed and implemented a locally derived intervention program to facilitate Chinese and English language learning among children from low-SES families. With longitudinal data collected from kindergarten children residing in Hong Kong, our findings suggested that our early intervention program was effective for improving the language and

reading skills of kindergarten students from low-SES families in Hong Kong, especially those with poor language skills prior to participation in the intervention.

Children who participated in the intervention program generally performed significantly better on the posttest with respect to phonological awareness and morphological awareness in Chinese and phonological awareness, vocabulary knowledge, and word reading in English, compared to their counterparts with low SES backgrounds in the control group. More importantly, children who participated in the intervention program also exhibited significantly greater posttest performance than their counterparts from middle-SES families in the control group in terms of phonological awareness and vocabulary knowledge in English. Finally, we identified three subgroups among children from low-SES families regarding language skills. The subgroup of participants who had low scores for language skills before enrolling in the intervention benefitted the most from our intervention program.

Our findings also indicate some possible directions for future research. First, the intervention program may be adapted to be suitable for second-grade kindergarteners. Second, incorporating executive functioning skills into the program may be beneficial for further strengthening language and reading skills. Finally, considering the significance of parental involvement and home literacy environment in shaping children's language development (Suskind et al., 2016), teachers and practitioners may consider involving parents in the intervention and equipping them with knowledge and skills required to support the language and literacy acquisition of their children.

10 References

- Baker, A. J. L., Piotrkowski, C. S., & Brooks-Gunn, J. (1999). The home instruction program for preschool youngsters (HIPPY). *The Future of Children*, 9, 116–133.
- Ben-Dror, I., Bentin, S., & Frost, R. (1995). Semantic, phonologic, and morphologic skills in reading disabled and normal children: Evidence from perception and production of spoken Hebrew. *Reading Research Quarterly*, 876-893.
- Bus, A. G., & van IJzendoorn, M. H. (1999). Phonological awareness and early reading: A meta-analysis of experimental training studies. *Journal of Educational Psychology*, 91, 403-414.
- Casalis, S., & Louis-Alexandre, M. F. (2000). Morphological analysis, phonological analysis and learning to read French: A longitudinal study. *Reading and Writing*, 12, 303-335.
- Catts, H. W., Adlof, S. M., & Weismer, S. E. (2006). Language deficits in poor comprehenders: A case for the simple view of reading. *Journal of Speech, Language, and Hearing Research*, 49, 278-293.
- Census and Statistics Department (2016). *Population and household statistics 2015*. Hong Kong: Census and Statistics Department.
- Chen, X., & Kao, H. S. R. (2002). Visual-spatial properties and orthographic processing of Chinese characters. In H. S. R. Kao, C.-K. Leong, & D.-G. Gao (Eds.), *Cognitive neuroscience studies of the Chinese language* (pp. 175–194). Hong Kong: Hong Kong University Press.
- Chen, X., Xu, F., Nguyen, T.-K., Hong, G., & Wang, Y. (2010). Effects of cross-language transfer on first-language phonological awareness and literacy skills in Chinese children receiving English instruction. *Journal of Educational Psychology*, 102, 712-728.

- Chung, K. K. H., Lam, C. B., & Cheung, K. C. (2018). Visuomotor integration and executive functioning are uniquely linked to Chinese word reading and writing in kindergarten children. *Reading and Writing, 31*, 155-171.
- Chung, K. K. H., Liu, H., McBride, C., Wong, A. M. Y., & Lo, J. C. (2017). How socioeconomic status, executive functioning and verbal interactions contribute to early academic achievement in Chinese children. *Educational Psychology, 37*, 402-420.
- Chung, K. K. H., Liu, H., McBride-Chang, C., Wong, A. M. Y., & Lo, J. C. M (under review). Cognitive and language contributions to academic achievement across Chinese children from different socioeconomic backgrounds. *Early Childhood Research Quarterly*.
- Chung, K. K. H., & McBride-Chang, C. (2011). Executive functioning skills uniquely predict Chinese word reading. *Journal of Educational Psychology, 103*, 909-921.
- Chung, K. K. H., Ho, C. S. H., Chan, D. W., Tsang, S. M., & Lee, S. H. (2011). Cognitive skills and literacy performance of Chinese adolescents with and without dyslexia. *Reading and Writing, 24*, 835-859.
- Chung, K. K. H., Tong, X., & McBride-Chang, C. (2012). Evidence for a deficit in orthographic structure processing in Chinese developmental dyslexia: An event-related potential study. *Brain Research, 1472*, 20-31.
- Comeau, L., Cormier, P., Grandmaison, É., & Lacroix, D. (1999). A longitudinal study of phonological processing skills in children learning to read in a second language. *Journal of Educational Psychology, 91*, 29-43.
- Currie, J. (2001). Early childhood education programs. *Journal of Economics Perspectives, 15*, 213–238.

- D'Angiulli, A., Siegel, L. S., & Serra, E. (2001). The development of reading in English and Italian in bilingual children. *Applied Psycholinguistics*, 22, 479-507.
- DeFrancis, J. (1984). Digraphia. *Word*, 35, 59-66.
- Duncan, G. J., Brooks-Gunn, J., & Klebanov, P. (1994). Economic deprivation and early childhood development. *Child Development*, 65, 296–318.
- Duncan, G. J., Ludwig, J., & Magnuson, K. A. (2007). Reducing poverty through preschool interventions. *The Future of Children*, 17, 143-160.
- Dunn, L. M., & Dunn, L. M. (1997). *Peabody picture vocabulary test (3rd Edition) (PPVT-III)*. Circle Pines, MN: American Guidance Service.
- Durgunoğlu, A. Y., Nagy, W. E., & Hancin-Bhatt, B. J. (1993). Cross-language transfer of phonological awareness. *Journal of Educational Psychology*, 85, 453-465.
- Ehri, L. C. (2014). Orthographic mapping in the acquisition of sight word reading, spelling memory, and vocabulary learning. *Scientific Studies of Reading*, 18, 5-21.
- Fantuzzo, J., Perry, M. A., & McDermott, P. (2004). Preschool Approaches to Learning and Their Relationship to Other Relevant Classroom Competencies for Low-Income Children. *School Psychology Quarterly*, 19, 212-230.
- Feldman, L. B., & Siok, W. W. (1999). Semantic radicals contribute to the visual identification of Chinese characters. *Journal of Memory and Language*, 40, 559-576.
- Foster, W. A., & Miller, M. (2007). Development of the literacy achievement gap: A longitudinal study of kindergarten through third grade. *Language, Speech, and Hearing Services in Schools*, 38, 173-181.

- Gao, D.-G., & Kao, H. S. R. (2002). Psycho-geometric analysis of commonly used Chinese characters. In H. S. R. Kao, C.-K. Leong, & D.-G. Gao (Eds.), *Cognitive neuroscience studies of the Chinese language* (pp. 195–206). Hong Kong: Hong Kong University Press.
- Good, J. E., Lance, D. M., & Rainey, J. (2015). The effects of morphological awareness training on reading, spelling, and vocabulary skills. *Communication Disorders Quarterly*, 36, 142-151.
- Goswami, U., & Bryant, P. (1990). *Essays in developmental psychology series. Phonological skills and learning to read*. Hillsdale, NJ, US: Lawrence Erlbaum Associates, Inc.
- Gottardo, A., Yan, B., Siegel, L. S., & Wade-Woolley, L. (2001). Factors related to English reading performance in children with Chinese as a first language: More evidence of cross-language transfer of phonological processing. *Journal of Educational Psychology*, 93, 530-542.
- Hart, B., & Risley, T. R. (1995). *Meaningful differences in the everyday experience of young American children*. Baltimore: Paul H. Brookes.
- Ho, C. S. H., Yau, P. W. Y., & Au, A. (2003). Development of orthographic knowledge and its relationship with reading and spelling among Chinese kindergarten and primary school children. In C. McBride-Chang & H.-C. Chen (Eds.). *Reading development in Chinese children* (pp.51-71). London: Praeger.
- Hoosain, R. (2013). *Psycholinguistic implications for linguistic relativity: A case study of Chinese*. Psychology Press.
- Huang, H. S., & Hanley, J. R. (1995). Phonological awareness and visual skills in learning to read Chinese and English. *Cognition*, 54, 73-98.
- Huang, J. Y. (2005). *Study of stroke order in Hanzi*. Taipei: Camel publishing Ltd.

- Kalindi, S. C., & Chung, K. K. H. (2018). The Impact of Morphological Awareness on Word Reading and Dictation in Chinese Early Adolescent Readers With and Without Dyslexia. *Frontiers in Psychology*, 9, 511.
- Karami, J., Abbasi, Z., & Zakei, A. (2013). The effect of phonological awareness training on speed, accuracy and comprehension of students with dyslexia. *Journal of Learning Disabilities*, 2, 38-53.
- Keung, Y. C., & Ho, C. S. H. (2009). Transfer of reading-related cognitive skills in learning to read Chinese (L1) and English (L2) among Chinese elementary school children. *Contemporary Educational Psychology*, 34, 103-112.
- Korat, O. (2005). Contextual and non-contextual knowledge in emergent literacy development: A comparison between children from low SES and middle SES communities. *Early Childhood Research Quarterly*, 20, 220–238.
- Leck, K. J., Weekes, B. S., & Chen, M. J. (1995). Visual and phonological pathways to the lexicon: Evidence from Chinese readers. *Memory & Cognition*, 23, 468-476.
- Lin, J. W. (2006). Time in a language without tense: The case of Chinese. *Journal of Semantics*, 23, 1-53.
- Liu, D., Chung, K. K. H., & McBride, C. (2016). The role of SES in Chinese (L1) and English (L2) word reading in Chinese-speaking kindergarteners. *Journal of Research in Reading*, 39, 268-291.
- Liu, I. M., Chuang, C. J., & Wang, S. C. (1975). *Frequency count of 40,000 Chinese words*. Taipei: Lucky Books.

- Liu, P. D., McBride-Chang, C., Wong, A. M. Y., Tardif, T., Stokes, S. F., Fletcher, P., & Shu, H. (2010). Early oral language markers of poor reading performance in Hong Kong Chinese children. *Journal of Learning Disabilities, 43*, 322-331.
- Lonigan, C. J., Schatschneider, C., & Westberg, L. (2008). Identification of children's skills and abilities linked to later outcomes in reading, writing, and spelling. In *Developing early literacy: Report of the National Early Literacy Panel*. pp. 55–106. Washington, DC: National Institute for Literacy.
- Ludwig, J., & Phillips, D. (2008). Long-term effects of Head Start on low-income children. *Annals of the New York Academy of Sciences, 40*, 1-12.
- Lundberg, I., Larsman, P., & Strid, A. (2012). Development of phonological awareness during the preschool year: the influence of gender and socio-economic status. *Reading and Writing, 25*, 305-320.
- Mattingly, I. G. (1992). Linguistic awareness and orthographic form. In R. Frost & L. Katz (Eds.), *Orthography, phonology, morphology, and meaning* (pp. 11-26). Amsterdam: Elsevier Science.
- Mayer, A., & Motsch, H. J. (2015). Efficacy of a Classroom Integrated Intervention of Phonological Awareness and Word Recognition in “Double-Deficit Children” Learning a Regular Orthography. *Journal of Education and Learning, 4*, 88-111.
- McBride-Chang, C., Bialystok, E., Chong, K. K., & Li, Y. (2004). Levels of phonological awareness in three cultures. *Journal of Experimental Child Psychology, 89*, 93-111.
- McBride-Chang, C., & Ho, C. S. H. (2000). Developmental issues in Chinese children's character acquisition. *Journal of Educational Psychology, 92*, 50-55.
- McBride-Chang, C., & Ho, C. S. H. (2005). Predictors of beginning reading in Chinese and

- English: A 2-year longitudinal study of Chinese kindergartners. *Scientific Studies of Reading*, 9, 117-144.
- McBride-Chang, C., Lam, F., Lam, C., Doo, S., Wong, S. W. L., & Chow, Y. Y. Y. (2008). Word recognition and cognitive profiles of Chinese pre-school children at-risk for dyslexia through language delay or familial history of dyslexia. *Journal of Child Psychology and Psychiatry*, 49, 211-218.
- McBride-Chang, C., Shu, H., Zhou, A., Wat, C. P., & Wagner, R. K. (2003). Morphological awareness uniquely predicts young children's Chinese character recognition. *Journal of Educational Psychology*, 95, 743-751.
- McBride-Chang, C., & Treiman, R. (2003). Hong Kong Chinese kindergartners learn to read English analytically. *Psychological Science*, 14, 138-143.
- Melby-Lervåg, M., Lyster, S. A. H., & Hulme, C. (2012). Phonological skills and their role in learning to read: a meta-analytic review. *Psychological Bulletin*, 138, 322-352.
- Moffitt, T. E., Arseneault, L., Belsky, D., Dickson, N., Hancox, R. J., Harrington, H. & Caspi, A. (2011). A gradient of childhood self-control predicts health, wealth, and public safety. *Proceedings of the National Academy of Sciences*, 108, 2693-2698.
- Noble, K. G., Farah, M. J., & McCandliss, B. D. (2006). Socioeconomic background modulates cognition-achievement relationships in reading. *Cognitive Development*, 21, 349-368.
- Packard, J. L. (2000). *The morphology of Chinese: A linguistic and cognitive approach*. Cambridge University Press.
- Packard, J. L., Chen, X., Li, W., Wu, X., Gaffney, T. S., Li, H., & Anderson, R. C. (2006). Explicit instruction in orthographic structure and word morphology helps Chinese children learn to write characters. *Reading and Writing: An Interdisciplinary Journal*, 19, 457-487.

- Perfetti, C. A., & Zhang, S. (1995). Very early phonological activation in Chinese reading. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 21, 24-33.
- Perfetti, C. A., Zhang, S., & Berent, I. (1992). Reading in English and Chinese: Evidence for a “universal” phonological principle. In *Advances in psychology* (Vol. 94, pp. 227-248). North-Holland.
- Qi, C. H., Kaiser, A. P., Milan, S., & Hancock, T. (2006). Language performance of low-income African American and European American preschool children on the PPVT-III. *Language, Speech & Hearing Service in School*, 37, 5–16.
- Rack, J. P., Snowling, M. J., & Olson, R. K. (1992). The nonword reading deficit in developmental dyslexia: A review. *Reading Research Quarterly*, 27, 29-53.
- Reynolds, A. J., Temple, J. A., White, B. A., Ou, S. R., & Robertson, D. L. (2011). Age 26 Cost–Benefit Analysis of the Child-Parent Center Early Education Program. *Child Development*, 82, 379-404.
- Reynolds, M. E., & Fish, M. (2010). Language skills in low-SES rural Appalachian children: Kindergarten to middle childhood. *Journal of Applied Developmental Psychology*, 31, 238–248.
- Rimm-Kaufman, S. E., Pianta, R. C., Cox, M. J., & Bradley, R. H. (2003). Teacher-rated family involvement and children's social and academic outcomes in kindergarten. *Early Education and Development*, 14, 179-198.
- Roberts, T. A. (2008). Home storybook reading in primary or second language with preschool children: Evidence of equal effectiveness for second-language vocabulary acquisition. *Reading Research Quarterly*, 43, 103-130.

- Rodriguez, E. T., Tamis-LeMonda, C. S., Spellmann, M. E., Pan, B. A., Raikes, H., Lugo-Gil, J., & Luze, G. (2009). The formative role of home literacy experiences across the first three years of life in children from low-income families. *Journal of Applied Developmental Psychology, 30*, 677-694.
- Sénéchal, M. (2006). Testing the home literacy model: Parent involvement in kindergarten is differentially related to grade 4 reading comprehension, fluency, spelling, and reading for pleasure. *Scientific Studies of Reading, 10*, 59-87.
- Shankweiler, D., & Fowler, A. E. (2004). Questions people ask about the role of phonological processes in learning to read. *Reading and Writing, 17*, 483-515.
- Shen, H. H., & Bear, D. R. (2000). Development of orthographic skills in Chinese children. *Reading and Writing, 13*, 197-236.
- Shu, H., Chen, X., Anderson, R. C., Wu, N., & Xuan, Y. (2003). Properties of school Chinese: Implications for learning to read. *Child development, 74*, 27-47.
- Shu, H., McBride-Chang, C., Wu, S., & Liu, H. (2006). Understanding Chinese developmental dyslexia: Morphological awareness as a core cognitive construct. *Journal of Educational Psychology, 98*, 122-133.
- Shu, H., Peng, H., & McBride-Chang, C. (2008). Phonological awareness in young Chinese children. *Developmental Science, 11*, 171-181.
- Supplee, L. H., Shaw, D. S., Hailstones, K., & Hartman, K. (2004). Family and child influences on early academic and emotion regulatory behaviors. *Journal of School Psychology, 42*, 221-242.
- Suskind, D. L., Leffel, K. R., Graf, E., Hernandez, M. W., Gunderson, E. A., Sapolich, S. G., ... & Levine, S. C. (2016). A parent-directed language intervention for children of low

- socioeconomic status: A randomized controlled pilot study. *Journal of Child Language*, 43, 366-406.
- Teale, W. H., & Sulzby, E. (1986). *Emergent literacy: Writing and reading*. Norwood, NJ: Ablex Publishing Corporation.
- Tong, X., & McBride-Chang, C. (2010). Developmental models of learning to read Chinese words. *Developmental Psychology*, 46, 1662-1676.
- Tong, X., McBride-Chang, C., Shu, H., & Wong, A. M. (2009). Morphological awareness, orthographic knowledge, and spelling errors: Keys to understanding early Chinese literacy acquisition. *Scientific Studies of Reading*, 13, 426-452.
- Torgesen, J. K., Wagner, R. K., Rashotte, C. A., Burgess, S., & Hecht, S. (1997). Contributions of phonological awareness and rapid automatic naming ability to the growth of word-reading skills in second-to fifth-grade children. *Scientific Studies of Reading*, 1, 161-185.
- Tzeng, O. J., & Wang, W. S. Y. (1983). The first two R's: The way different languages reduce speech to script affects how visual information is processed in the brain. *American Scientist*, 71, 238-243.
- Wagner, M. M., & Clayton, S. L. (1999). The parents as teachers program: Results from two demonstrations. *The Future of Children*, 9, 91-115.
- Wagner, R. K., & Torgesen, J. K. (1987). The nature of phonological processing and its causal role in the acquisition of reading skills. *Psychological Bulletin*, 101, 192-212.
- Wagner, R. K., Torgesen, J. K., Rashotte, C. A., Hecht, S. A., Barker, T. A., Burgess, S. R. ... Garon, T. (1997). Changing relations between phonological processing abilities and word-level reading as children develop from beginning to skilled readers: A 5-year longitudinal study. *Developmental Psychology*, 33, 468-479.

- Walker, D., Greenwood, C., Hart, B., & Carta, J. (1994). Prediction of school outcomes based on early language production and socioeconomic factors. *Child Development*, 65, 606–621.
- Wells, G. (1985). Preschool literacy related activities and success in school. In D. Olson, G. Torrance, & A. Hildyard (Eds.), *Literacy language and learning: the nature and consequences of reading and writing* (pp. 229–255). New York, NY: Cambridge University Press.
- Yeong, S. H., & Liow, S. J. R. (2012). Development of phonological awareness in English–Mandarin bilinguals: A comparison of English–L1 and Mandarin–L1 kindergarten children. *Journal of Experimental Child Psychology*, 112, 111–126.
- Yeung, H. H., Chen, K. H., & Werker, J. F. (2013). When does native language input affect phonetic perception? The precocious case of lexical tone. *Journal of Memory and Language*, 68, 123–139.
- Yeung, S. S., & Ganotice, F. A. (2014). The role of phonological awareness in biliteracy acquisition among Hong Kong Chinese kindergarteners who learn English-as-a-second language (ESL). *The Asia-Pacific Education Researcher*, 23, 333–343.
- Zhou, X., Zhuang, J., & Yu, M. (2002). Phonological activation of disyllabic compound words in the speech production of Chinese. *Acta Psychologica Sinica*, 34, 242–247.

Appendices

Appendix A. Outline of Chinese sessions.

活動	學習元素	學習目標	學習內容
1 出發了	語音意識 Phonological Awareness	增強音節運用的能力 說出詞語中被省略的字 提升口語詞彙的運用 (Verbal Vocabulary)	在馬戲團看到的東西： 小丑、汽球 摩天輪、過山車 旋轉木馬、空中飛人、花式表演
2 動物 大匯演		增強音節運用的能力 識別詞語中音節位置的能力 提升口語詞彙的運用 (Verbal Vocabulary)	不同動物的名稱： 犀牛、孔雀、駱駝、海獅、袋鼠、企鵝 長頸鹿、八爪魚、北極熊、貓頭鷹、斑點狗、寄居蟹
3 百變 商店	語素意識 Morphological Awareness	提升運用語素構詞的技巧 擴充名詞的口語詞彙數量 運用名詞加強組合短句能力	以固定語素「店」組詞 口述句式：「我☐(地點)見過『(自由語素)店』。」
4 拼拼 說說		認識新詞語的形成規律 擴充名詞的口語詞彙數量	重溫以固定語素「店」組詞 以固定語素「水」、「車」和「包」組詞
5 真好玩		提升分辨語素意義的能力 (同音異字)	同音字「綠、六」、「紅、熊」、「師、獅」
6 小攤位		提升分辨語素意義的能力 (同音異字)	同音字詞語： 紫色、紙杯、紙盒、紙張 牙膏、雪糕、蛋糕、年糕 三角形、三點鐘、☐衫、第三名 醫生、洗衣機、泳衣、雨衣 足球場、長褲、長頭髮、長袖衫 風車、龍捲風、蜜蜂、風筒
7 馬戲團 列車	綜合活動 Integration	重溫音節的概念 重溫語素詞語	重溫音節的概念 重溫與馬戲團相關的口語詞彙

			重溫「店」、「水」、「包」等語素組成的詞語
8 幸運 摩天輪		重溫語素的意義	重溫不同語素的意義（同音異字）

活動	學習元素	學習目標	學習內容
9 開心 照相館	字形結構 Orthographic Structure	認識獨體字 認識左右結構字	獨體字： 天、車、馬、月、女、中 左右結構字： 朋、球、演、休、期、師
10 旋轉 音樂盒		形旁部首 (Semantic Radical) 認識全包围結構字 認識上下結構字	全包围結構字： 團、國、田、因、回、困、園、 圍、圓、圖、固、圃 上下結構字： 早、息、男、空、耍、雪、去、 古、字、星、六
11 文字 大抽獎		聲旁 (Phonetic Radical) 認識形旁部首的意義及其字彙	部首「口」及其字彙： 唱、叫、咬、喝、吹、吃、哈
12 趣怪 小丑			部首「手」及其字彙： 拉、推、拍、摸、摺、抹 口述句式： 「我用手（手部動作）。」
13 尋寶 樂園		聲旁 (Phonetic Radical) 認識聲旁的意義及其字彙	認識聲旁「白」、「青」、「可」及其字彙
14 畫畫 Bingo	詞彙知識 Vocabulary Knowledge	增強對常見字詞字形及意義之間的 聯想 運用形容詞加強組合短句能力	目標字詞： 本領、鼓掌、期待、欣賞、觀 眾、表演、假期、家庭
15			目標字詞（形容詞）：

哈哈鏡			快樂、精彩、有趣、繽紛、驚險 口述句式： 「我覺得好 <u>（形容詞）</u> ，因為.....」
16 小舞台	綜合活動 Integration	重溫結構字 重溫部首	重溫： 「獨體字」、「左右結構字」、 「全包围結構字」及「上下結構字」 部首「手」和「口」

活動	學習元素	學習目標	學習內容
17 我是 創作家	口語表達 Oral Language	句子創作 (Sentence Making) 加強掌握句子的結構及造句能力	分辨組成句子的四個元素：「時間」、「人物」、「地點」、「事情」 依照預設的句子結構口頭造句 例： <u>星期天</u> ， <u>小丑</u> 在 <u>馬戲團</u> <u>變魔術</u> 。 (時間) (人物) (地點) (事情)
18 創意 馬戲團		故事創作 (Story Telling) 提升組織句子及口語表達能力	學習運用「時間」、「人物」、「地點」、「事情」四個元素創作句子 利用句子組成故事

Appendix B. *Outline of English sessions.*

Activities	Domains	Learning objectives	Content	Magic Word lists
1 Human Body Parts	Oral language & Vocabulary Knowledge	Name the human body parts	Sing the “Hello Hello” song. Introduce the story of Monkey Oreo. Name different body parts.	Teeth, hands, face, hair
2 Human Body Parts	Oral language & Vocabulary Knowledge	Match verbs to suitable nouns	Match verbs to suitable body parts. Sing the “Cleaning the Body” song.	Brush, wash, comb, take
3 Human Body Parts	Oral language & Vocabulary Knowledge	Recognise human body parts; answer questions using short sentences	Match picture cards with the printed words. Be familiarized with the conversation pattern: “ <i>What can you do?</i> ” “ <i>I can...</i> ”	Brush my teeth, wash my hands/face/hair, comb my hair, take a shower
4 Shapes	PA & Vocabulary Knowledge	Name shapes and clap out the syllables of words	Match the objects to shapes. Clap out the syllables of words with 2 to 3 syllables.	Triangles, circles, rectangles, hearts
5 Shapes	PA & Oral language	Count the numbers of syllables of words	Be familiarised with the conversation pattern: “ <i>How many triangles are there?</i> ” “ <i>There are...</i> ” Use different shapes to create a Christmas bag. Name the shapes. Count the syllables of words.	One, two, three, four, five
6 Transportations	Integration	Revise vocabularies	Review the vocabularies learnt in previous lessons.	/

Activities	Domains	Learning objectives	Content	Magic Word lists
7 Animals	Oral language & Vocabulary Knowledge	Name animals	Play guessing and whispering games using animals names.	Cats, mouse, giraffes, elephant s
8 Animals	PA & Oral language	Match adjectives to nouns and recognise rhymes in words	Match the adjectives to animals. Playing rhyming games.	Tall, short, big, small, fat, thin
9 Sports	PA & Vocabulary Knowledge	Name sports	Name sports through catching and throwing games.	Tennis ball, football, basketball
10 Sports	PA & Oral language	Identify onsets; answer questions using short sentences	Be familiarised with the conversation pattern <i>"What do you like?" "I like to play..."</i> Identify onsets.	Play
11 Sports	PA & Oral language	Discriminate onsets and rimes	Discriminate onsets and rimes	/
12 Bingo	Integration	Review words and PA skills	Integrate previously learn oral vocabularies and word recognition and PA skills	/

Appendix C. Exemplar session on Chinese (2nd session)

香港教育大學
The Education University of Hong Kong

Department of Early Childhood Education
幼兒教育學系

Unit for Child and Family Science
幼兒及家庭科學中心

「語樂童行」教材書
中文教學活動

活動三 動物大匯演

學習元素 語音意識 (Phonological Awareness)

學習目標

- 1) 增強音節運用的能力
- 2) 識別詞語中音節位置的能力
- 3) 提升口語詞彙的運用

教具

小丑手偶、音樂、馬鈴、馬戲團圖片、歡樂馬戲團人物、表演、物件及遊樂設施字詞圖卡 (小丑、汽球、摩天輪、過山車、旋轉木馬、空中飛人、花式表演)、馬戲團動物表演圖卡 (熊貓、獅子、猴子、大象)、動物圖卡 (犀牛、孔雀、駱駝、海獅、袋鼠、企鵝、長頸鹿、八爪魚、北極熊、貓頭鷹、斑點狗、寄居蟹)、動物骰子 (4粒)、音節位置骰子 (4粒)、馬戲團背景圖、寶貼

活動程序	教具
引起動機 / 暖身：	
1 老師與幼兒一同聆聽並配合動作唱出【你好嗎？】，利用小丑手偶及馬鈴與幼兒打招呼。	小丑手偶、音樂、馬鈴
2 老師播放主題公園的輕快音樂，問幼兒：「你哋記得記得上星期我哋去咗邊度玩呀？」同時展示馬戲團的圖片提問幼兒：「咁我哋馬戲團入面睇到乜嘢？」引導幼兒說出上一個課節曾學過的詞彙 (老師可於幼兒一邊說出字詞時，一邊展示相關的字詞圖卡作提示)。	馬戲團圖片、歡樂馬戲團人物、表演、物件及遊樂設施字詞圖卡

活動四

學習目標：

- 1 老師展示馬戲團動物表演圖卡，提問幼兒：「小朋友，你哋知唔知呢啲動物做緊乜嘢呀？」請幼兒嘗試表達意見。
- 2 出示不同的動物圖卡向幼兒介紹各種動物的名稱，告訴幼兒：「除咗頭先啲幾隻動物，不如我哋邀請多啲動物一齊去馬戲團表演呀！」
- 3 老師請幼兒分成兩組，邀請他們進行擲骰子遊戲。
- 4 老師將動物按名稱分成兩字詞和三字詞兩組，將圖畫分別貼在骰子上，另外每組預備兩音節和三音節位置的骰子各一粒 (見下圖)。

兩字詞的圖：

犀牛	×	○
孔雀	○	×
駱駝	×	○
海獅	○	×
袋鼠	×	×
企鵝	○	○

三字詞的圖：

長頸鹿	×	○	○
八爪魚	○	×	×
北極熊	○	○	×
貓頭鷹	○	×	×
斑點狗	○	×	×
寄居蟹	×	×	×

活動五

學習目標：

- 5 每次請每位幼兒擲動物骰子，另一位幼兒擲音節位置骰子。例如幼兒擲骰子後的組合是「犀牛 / × ○ ○」，該兩位幼兒便需以拍手代替第一個音節，並只說出第二個音節：「牛」。
- 重複步驟5，讓每位幼兒也有參與的機會。

(小提示：老師在活動前可作示範，也建議先與幼兒進行兩字詞動物骰子及兩音節骰子活動，然後才進行三字詞的活動。)

總結：

- 1 老師將不同的動物圖卡貼在馬戲團背景圖上，表示動物要進行大匯演了。
- 2 提問幼兒：「除咗呢啲動物，你哋仲想有乜嘢動物一齊去馬戲團表演呀？」老師播放音樂，請幼兒隨自己的喜好說出動物名稱及創作表演動作。
- 3 老師與幼兒一同聆聽並配合動作唱出【再見歌】。
- 4 與幼兒說說回家小任務。

預期活動成效：

- 識別兩字詞和三字詞中音節的位置
- 認識不同動物的名稱 (犀牛、孔雀、駱駝、海獅、袋鼠、企鵝、長頸鹿、八爪魚、北極熊、貓頭鷹、斑點狗、寄居蟹)

• 【馬戲團圖片】、【歡樂馬戲團人物、表演、物件及遊樂設施字詞圖卡】 (小丑、汽球、摩天輪、過山車、旋轉木馬、空中飛人、花式表演) 見活動一

Appendix D. Exemplar session on English (3rd session)

香港教育大學
The Education University of Hong Kong

Department of Early Childhood Education
幼兒教育學系

Learn with CHINESE and ENGLISH
學與教

"Joy of Learning Literacy" - JOLLY
English Learning Activities

Lesson 3

Lesson Three

Theme: Human Body Parts

Domain Oral language and vocabulary knowledge skills

Learning objectives Children are able to:

1. Match verbs to suitable body parts
2. Be familiarised with the conversation pattern: "What can you do?" "I can _____."

Teaching aids / materials

Speaker, Sentence cards, Phrase cards with pictures, Picture cards, Hula hoops, Beanbags, Magic spell poster, and Song posters (including the "Hello Hello" song and the "Goodbye" song).

Activities	Teaching aids / materials
Introduction / Warm up and review	
1 The teacher sits in a circle with the children.	Speaker
2 The teacher says "Hello!" to the children, and invites the children to do the same to one another.	
3 The group listens to the "Hello Hello" song. The teacher encourages the children to sing and dance along the music.	"Hello Hello" song poster
4 The teacher shows the phrase cards with pictures: "Brush the teeth. / Wash the face / hair / hands. / Comb the hair. / Take a shower." The teacher reads the phrases aloud together with the children.	Phrase cards with pictures

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Activities	Teaching aids / materials
Main Activities	
1 The teacher introduces the sentences, "What can you do? I can (<u>brush my teeth / comb my hair / take a shower / wash my face / hair / hands</u>)."	Sentence cards
2 The teacher places six hula hoops on the floor. The teacher then places a pictures cards (brush my teeth / comb my hair / take a shower / wash my face / hair / hands) in each hula hoop.	Hula hoops Pictures cards
3 The teacher plays the following game with the children: One child asks the question, "What can you do?" Another child answers the question by throwing a beanbag to the hula hoop with the corresponding picture card in it, saying the phrase out loud with exaggerated gestures.	Beanbags
4 The teacher plays the following game with the children: The children are divided into groups of five or six. Each child gets one picture card. The child looks at the card and keeps the card content a secret. One child asks the question, "What can you do?" The other children answer the question, based on what is printed on their cards, by saying "I can _____."	Picture cards
Conclusion	
1 The teacher says the magic spell with the children: "Goodbye Oreo. Goodbye Oreo."	Speaker Magic spell poster
2 The group listens to the "Goodbye" song. The teacher encourages the children to sing and dance along the music.	"Goodbye" song poster
3 The teacher says goodbye to the children.	

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Lesson 3

Expected outcomes

- Answer the question, "What can you do?", using the sentence, "I can (brush my teeth / comb my hair / take a shower / wash my face / hair / hands)."

• For examples of Medal stickers, Magic spell poster, and "Hello Hello" song and "Goodbye" song posters, please refer to Lesson 1.

• For examples of Phrase cards with pictures, please refer to Lesson 2.

Picture cards

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Appendix E. *Descriptive information of the participants.*

	Intervention Group, Low-SES		Control Group, Low-SES		Control Group, Middle-SES	
	(n = 120)		(n = 95)		(n = 88)	
	Mean / n	SD / %	Mean / n	SD / %	Mean / n	SD / %
Age in pretest (months)	63.95	4.03	64.00	3.85	64.02	3.96
Gender-girls	53	44%	40	42%	38	43%
Monthly household income						
<=HK\$15,000 (or US\$1,923)	52	47%	27	31%	20	26%
HK\$15,001-45,000 (or US\$1,923-5,769)	54	49%	50	57%	45	58%
>=HK\$45,001 (or US\$5,769)	5	4%	10	12%	12	16%
Parental education level in pretest						
Primary school	7	7%	7	8%	4	5%
Secondary school	75	71%	57	61%	49	60%
Sub-degree and degree	23	21%	27	29%	28	35%
Post-graduate	1	1%	2	2%	0	-

Appendix F. *Results of ANCOVAs among children with low-SES in the intervention and control groups.*

		Intervention Group, Low-SES		Control Group, Low-SES		ANCOVA	
	<i>Cronbach's alpha</i>	Mean	<i>SD</i>	Mean	<i>SD</i>	<i>F</i> value	Partial η^2
Pretest							
PA-Chi	.91	11.26	6.37	10.10	7.51	.46	.005
MA-Chi	.85	6.54	4.45	6.63	4.79	.13	.001
VoK-Chi	.70	30.02	7.49	28.27	7.18	.89	.010
Read-Chi	.98	26.98	16.77	26.10	18.16	.11	.001
PA-Eng	.77	3.94	2.16	3.80	2.30	.37	.004
Vok-Eng	.95	31.26	12.32	32.75	11.25	.19	.002
Read-Eng	.96	2.08	3.56	5.32	11.26	3.13	.035
Posttest							
PA-Chi	.92	18.82	5.99	15.00	7.72	4.13*	.056
MA-Chi	.88	13.76	5.00	11.73	5.48	5.27*	.071
VoK-Chi	.79	35.29	7.27	33.43	7.32	.26	.004

Appendix F continued.

Read-Chi	.97	42.67	17.10	36.97	17.63	.83	.012
PA-Eng	.74	6.64	1.51	4.77	1.94	26.20**	.275
Vok-Eng	.94	45.38	6.49	36.20	11.96	12.38**	.152
Read-Eng	.97	8.80	10.04	6.70	11.19	8.12**	.105

Notes: PA = phonological awareness, MA = morphological awareness, VoK = vocabulary knowledge, Read = reading ability, Chi = Chinese, Eng = English.

* $p < .05$, ** $p < .01$

Appendix G. *Results of ANCOVAs among children with low-SES in the intervention groups, and children with middle-SES in the control group.*

	Intervention Group, Low-SES		Control Group, Middle-SES		ANCOVA	
	Mean	<i>SD</i>	Mean	<i>SD</i>	<i>F</i> value	Partial η^2
Pretest						
PA-Chi	11.26	6.37	13.05	8.76	1.08	.012
MA-Chi	6.54	4.45	6.00	4.30	.43	.005
VoK-Chi	30.02	7.49	30.14	9.20	.04	.000
Read-Chi	26.98	16.77	28.49	18.93	.12	.001
PA-Eng	3.94	2.16	3.89	2.28	.17	.002
Vok-Eng	31.26	12.32	34.78	9.83	1.08	.012
Read-Eng	2.08	3.56	5.78	7.64	7.14**	.072
Posttest						
PA-Chi	18.82	5.99	17.79	9.92	.26	.003
MA-Chi	13.76	5.00	10.85	5.77	2.40	.027
VoK-Chi	35.29	7.27	34.64	8.12	.27	.003
Read-Chi	42.67	17.10	40.64	16.65	.11	.001

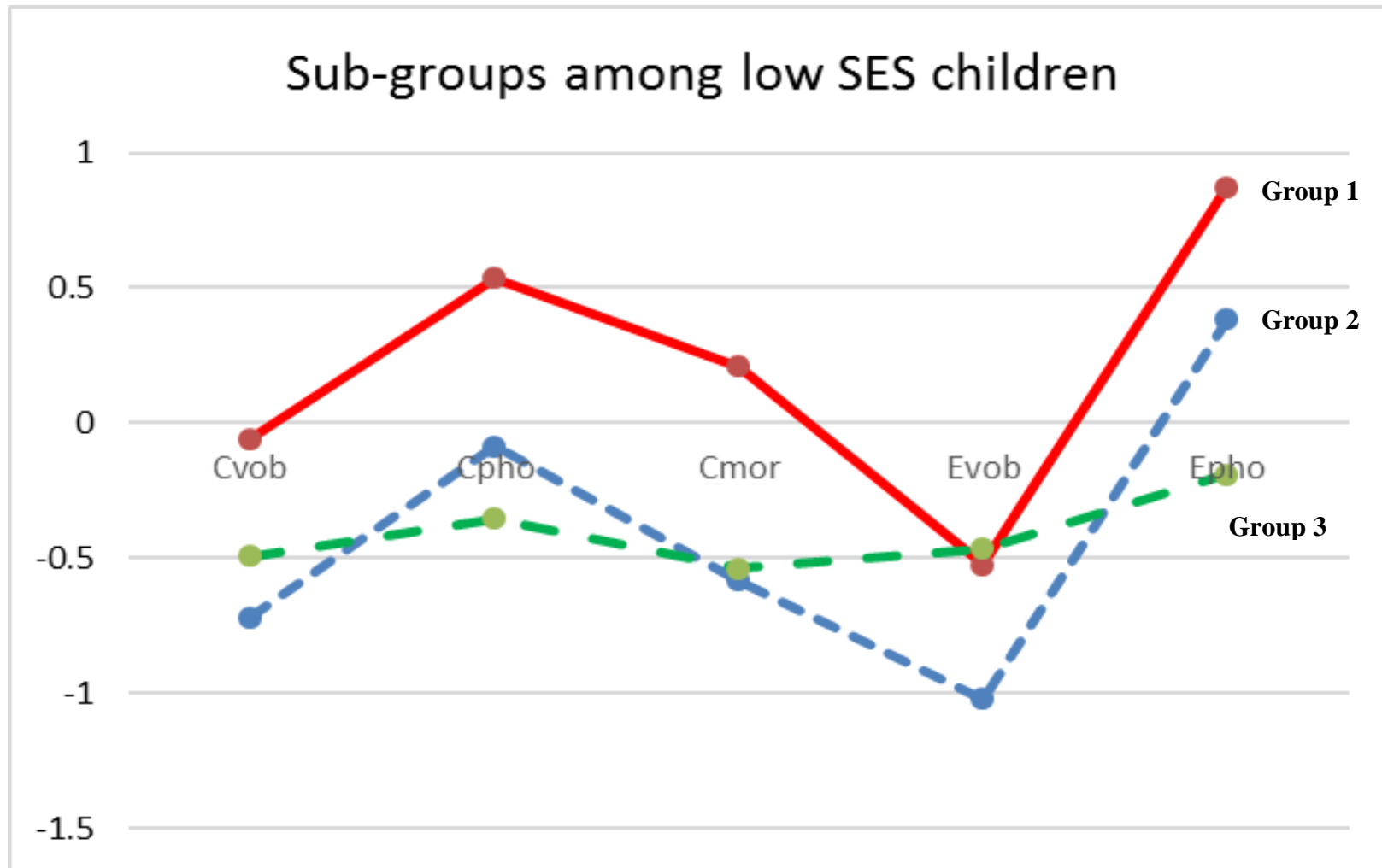
Appendix G continued.

PA-Eng	6.64	1.51	4.67	2.18	23.17**	.212
Vok-Eng	45.38	6.49	34.79	12.85	31.51**	.268
Read-Eng	8.80	10.04	8.85	8.78	2.00	.023

Notes: PA = phonological awareness, MA = morphological awareness, VoK = vocabulary knowledge, Read = reading ability, Chi = Chinese, Eng = English.

* $p < .05$, ** $p < .01$

Appendix H. Results of cluster analysis among low-SES children.



Notes: Group 1 = high scores for all language skills; Group 2 = low scores for all language skills; Group 3 = high scores for English vocabulary knowledge but low scores for all other skills.