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Mother-child joint writing in Chinese kindergarten children:

Metalinguistic awareness, maternal mediation, and literacy acquisition

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Abstract

The present study examined the relations of Chinese word reading and writing to both maternal mediation of writing and a number of metalinguistic and cognitive skills in 63 Hong Kong Chinese kindergartners. The whole process of maternal mediation of writing was videotaped, in which mothers were asked to help their children to write twelve two-character words presented in pictures in their own way. This study replicated and extended previous work on the cognitive strategies mothers use to help children in writing Chinese words. Mothers' typical mediation strategies were positively and significantly associated with both children's independent word reading and writing. In addition, maternal mediation of writing was uniquely associated with Chinese word reading, but not word writing, even with metalinguistic and cognitive skills, including phonological awareness, morphological awareness, orthographic processing, and visual knowledge, statistically controlled. Findings underscore the importance of mothers' early scaffolding in facilitating children's literacy acquisition.

Mother-child joint writing in Chinese kindergarten children:

Meta-linguistic awareness, maternal mediation, and literacy acquisition

The present study focused on the association of mother-child joint shared writing for early literacy skills, including both word reading and word writing in Hong Kong Chinese children. This is particularly important in Hong Kong because these children begin learning formal reading and writing in school as early as age 3.5 years (Hong Kong Education Department, 1996). This practical reality of a very early focus on literacy is likely at least partly attributable to the fact that the Hong Kong government prioritizes bilingual or trilingual literacy and language proficiency very highly. Indeed, Hong Kong is unique in beginning this formal instruction so early (Cheung & Ng, 2003). Li and Rao (2000) investigated 160 Hong Kong Chinese parents, and found that over 70% reported teaching their 2- to 6-year-old children to read Chinese characters; over 50% of parents said that they taught writing at home. In addition, most of these parents (around 60%) believed that preschool was the appropriate time to begin teaching of reading and writing. As previous research has suggested that mothers play a particularly important role in home literacy (Chao & Tseng, 2002; Ho, 1996; Meisels, 1998), we focused only on mothers' interactions with their children in the present study. Broadly, we examined the extent to which shared mother-child writing would explain unique variance in children's own independent word reading and writing, particularly in relation to previously established reading-related cognitive and metalinguistic skills.

Mother-child joint writing (Aram, 2007; Aram & Levin, 2001, 2004; Burns &

Casbergue, 1992) has been shown to be moderately to strongly associated with children's literacy development across cultures. The idea behind mother-child joint writing is that children learn to perform better in a given task, such as the complex task of writing words, with the support of a skilled partner, such as the mother, following Vygotsky's (1978) idea of "zone of proximal development." For example, Aram and Levin (2001) found a strong association of maternal mediation to word reading and word writing skills as well as to phonological awareness among young Hebrew children. They further followed up these children and showed that maternal mediation was still predictive of children's reading and writing skills even 2.5 years later. A study of young Chinese children (Tan, Spinks, Eden, Perfetti, & Siok, 2005) also showed that writing skills greatly facilitated reading abilities, though that study was focused only on children's own writing skills, rather than joint mother-child writing.

In past work with Hong Kong Chinese children, Lin, McBride-Chang, Aram, Levin, Cheung, Chow, and Tolchinsky (2009) extracted six cognitive maternal mediation strategies for shared writing from observations of 67 mother-child Hong Kong Chinese dyads writing together. These researchers then established an ordered literate mediation scale including six independent strategies of, respectively, copy, stroke, visualization, segmentation, phonetic function, and morpheme from lower levels to higher levels of maternal mediation based on their correlation coefficients with children's independent reading skills. That study (Lin et al., 2009) examined all of these strategies across three levels of kindergarten children, namely, first year (ages

3-4 years), second year (ages 4-5 years), and third year (ages 5-6 years) kindergartners.

Lower-level mediation focused on strategies such as having the child copy the

Chinese character or correcting the shape of children's individual strokes in writing it.

Higher-level mediation was focused more on meaning-related (i.e., morphological)

knowledge, e.g., pointing out how two words shared the same character (or morpheme)

or noting that two characters shared the same semantic radical (the basic meaning unit

in most Chinese characters) indicating a broad category of morphemes. For example,

across characters, mothers might point out that two shared the same radical indicating

something having to do with the mouth (e.g., kiss, sing, and eat all contain a "mouth"

radical). (See Figure 2 for more examples of semantic radicals.) Results of the study

demonstrated that mother-child dyads used more advanced strategies in the scale for

older children (from ages 4 to 6 years). However, even controlling for children's grade

level and mothers' education levels, more advanced strategies were uniquely

associated with children's independent word reading, suggesting that individual

differences in children's word reading may be influenced in part by mothers'

scaffolding practices in children's early writing.

The strategies observed in that study and in the present one are admittedly

independent, or categorical. Many of the strategies considered to be low-level, such as

asking children simply to copy the word as printed by the mother, recur across

children of all ages tested. At the same time, however, that study (Lin et al., 2009),

like previous ones on alphabetic orthographies (e.g., Aram & Levin, 2001; 2004) also

validated an order of strategies from simpler to more meaning-related that we adapted

in the present study. Such ordering allowed us, ultimately, to calculate a single score, the typical level of maternal mediation used by the mother during the writing exercise. This single score could ultimately be examined in relation to children's independent metalinguistic skills and word reading and writing themselves.

Thus, the present study expanded upon this work by Lin et al. (2009) in order to replicate and refine the scale. Moreover, whereas the previous study examined the scale in relation to children's word reading only, the present study extended it to children's early writing skills. Importantly, we also included a variety of metalinguistic abilities demonstrated to be associated with early Chinese literacy development in previous studies in an attempt to distinguish these cognitive skills from mother-child interactions. The levels of this scale as adopted for the present study are presented in Figure 1. Figure 2 demonstrates some of the features in a Chinese word, including the phonetic and semantic radical within each character, as well as how these are structured within a given character, that were expanded in the newly revised scale.

Refinement of the scale was first focused on adding a strategy of "pointing out the character structure" in a middle level (level 4) within it. This level focuses particularly on orthographic information, i.e., how to represent characters using phonetic and semantic radicals in terms of position. The significance of the internal structure within characters has been emphasized in previous work (e.g., Shu & Anderson, 1997; Shu, Chen, Anderson, Wu, & Xuan, 2003). Thus, in the present study we included a focus on how mothers explicitly focused on the character

structure within words in their joint writing activities. For example, in writing 花 (flower) in the word 花瓶 (vase), a mother might point out to her child that 花 (flower) is a top-bottom structure with the component 艹 at the top and 化 at the bottom. This means that the semantic radical 艹 is above and the phonetic radical 化 is at the bottom. Because this focus makes use of knowledge of components within Chinese characters (which are usually the phonetic and semantic radicals comprising a single Chinese character), we ordered this level as higher than component mediation but lower than the explicit focuses on sound (i.e., phonetic) or meaning (i.e., semantic) within radicals. This decision was based on the fact that this latter focus on sound and meaning represents a more functional and deeper understanding of the functions of writing components within Chinese characters.

In addition to this added level of structure within the scale, we also expanded what was previously the highest level of maternal mediation as demonstrated in previous work (Lin et al., 2009) into two levels in the present study. The lower one (i.e., level 6) was at the semantic radical level, a within-character level. For example, in writing the character 蜂 (bee), a mother may explain that it is a kind of insect, and its writing contains the semantic radical 虫 (insect) on the left side of it.

The highest level (level 7) in the scale used in the present study was at the whole character level. At this level is an explanation or comparison between the target character and other characters or the same character in other words. For example, in writing the character 李 in the word 行李 (luggage), a mother may tell the children that this character is the same as your surname (meaning that both are written

as 李 and make the sound “lee.”) We conceptualized this as the highest level in the present study because it demands that children’s prior knowledge of single characters is used.

In the earliest years of learning to write in Chinese, the dominance of the “drill-and-practice” traditional philosophy in teaching Chinese characters is clear (Wu, Li, & Anderson, 1999). Lin et al. (2009), for example, found that 76% of all maternal mediation of Chinese word-writing consisted of the copying strategy in kindergartners and that this copying strategy was negatively associated with children’s actual word reading. However, we aimed to highlight other strategies which may be more effective in literacy acquisition. In addition, conceptually copy strategy itself may reflect more on autonomy granting of writing rather than cognitive mediation component. Therefore, in the present study we excluded the copying strategy, which was highly prevalent in the present study as well, and focused only on the other cognitive strategies used by mothers to help their children learn to write. Thus, the scale we used, refined from previous work (Lin et al., 2009) was ordered as shown in Figure 1.

Apart from the above refinements, other strategies included in the literate mediation scale remained the same as Lin et al. (2009) established. The developed ordinal maternal mediation scale was, in principle, largely in line with the work by Ho, Chan, Lee, Tsang, and Luan (2004), showing that children’s reading acquisition develops across at least three broad stages. These strategies tend to range from rote memorization of new characters to gradual acquisition of positional and functional regularities in Chinese characters. Ultimately, children begin to switch their attention

to inter-character or word-level characteristics. Similar ideas have also been documented in the study by Ho, Yau, and Au (2003) on children's writing development.

Apart from mother-child mediation in joint-writing activities, which can be considered at least partly an aspect of home environment, a number of studies have also demonstrated the importance of cognitive and metalinguistic skills for Chinese children's early literacy development. These include phonological awareness (e.g., Ho & Bryant, 1997a; McBride-Chang & Ho, 2000; Siok & Fletcher, 2001), morphological awareness (e.g., McBride-Chang, Shu, Zhou, Wat, & Wagner, 2003), orthographic awareness (e.g., Li, Peng, & Shu, 2006; Shu & Anderson, 1998) and visual skills (e.g., Ho & Bryant, 1999; Huang & Hanley, 1994). All of these have been linked to word reading in Chinese children in previous work. Some of these have also been examined in relation to word writing (e.g., Tong, McBride-Chang, Shu, & Wong, 2009), though rarely.

To summarize, the present study examined correlates of Hong Kong Chinese kindergartners' word reading and word writing in relation to both maternal mediation of writing and a number of metalinguistic and cognitive skills previously demonstrated to be associated with literacy skills in young Chinese children. In addition, because non-verbal IQ and mothers' education levels have also been found to be associated with early literacy skills in some previous work (e.g., Aram & Levin, 2001; Lin et al., 2009), we included them in the present study as control variables. The maternal mediation strategies of writing were of most interest in the present study

because this is a new area of inquiry, at least for Chinese families. Thus, we first analyzed and refined the scale of joint child-mother writing used previously (Lin et al., 2009) and then focused on its unique associations with various aspects of early literacy skill.

Method

Participants

Participants were 63 pairs of mothers and their children attending the third year of kindergarten in Hong Kong. There were 30 girls and 33 boys with a mean age of 5.81 years (ranging from 5.16 to 6.41 years, $SD = .29$).

All children and mothers were native Cantonese speakers. In Hong Kong, children start formal training in reading and writing as early as the first year of kindergarten (kindergartens last three years (K1, K2, and K3) in Hong Kong), when they are about 3.5 years old. Teaching, and indeed all communication, in kindergartens in Hong Kong are typically conducted in Cantonese in Hong Kong (Hong Kong Education Department, 1996). According to parents' reports, all participating children had had some prior experience with reading and writing both at school and at home.

Measures

Maternal mediation task in mother-child joint writing

Videotapes of mothers working together with their children in the joint writing activities served as the basis for measuring the quality of maternal mediation. Twelve 2-character words (six paired as shown in Appendix 1) depicted on picture cards were

presented to mother-child dyads one by one and mothers were asked to help their children to write these as “they saw fit”. Picture cards, rather than printed words, were used to indicate the words to be written, in order to avoid having children directly copy the written words and to ensure that mothers had as much freedom as possible to structure their writing work with their children. To make sure mothers and children were writing the words intended, each word was spoken by the experimenter when it was introduced on a given picture card. During the whole process, mothers and children were speaking in their native language, i.e., Cantonese.

These selected twelve words fell into five categories with the purpose of maximizing opportunities for using different strategies for writing facilitation as Lin et al (2009) did in their study. Note that the words were presented randomly, and mothers were never given any indication that any of the words should or did have any commonalities across them. However, we were interested in the extent to which mothers might notice patterns across these words (or other words the children might have already learned) that they might point out to their children.

Our pairings of words gave them an opportunity to highlight some patterns involving sound, meaning, structure, etc. As shown in Appendix 1, one of the five categories of commonalities across words was homophones. For example, in the matched word pairs of the words 孔雀--恐龍 (peacock--dinosaur), the two underlined characters in the words are homophones. Thus, mothers could have pointed out that, although these characters are written differently, they sound the same.

A second category was that of homographs. For example, in the word pair

行李 -- 銀行 (luggage--bank), the underlined characters in the words are written the same but have different meanings and pronunciations (similar to “bow” as in “Bow to the audience” vs. “There is a pretty bow in her hair”). A third category was reverse-ordered characters. For example, in the word pair of 蜜蜂 -- 蜂蜜 (bee-honey), the two characters in the words are identical. However, the order in which they fall is reversed for the first and second words. A fourth category we considered involved visually similar characters. For example, in the matched pair of 免費 -- 兔子 (free--rabbit), the underlined characters have similar appearances, but the characters have very different meanings and pronunciations. The final category involved word pairs with the same phonetic components but different semantic components. For example, in the pair 他們 -- 她們 (they (male)—they (female)), the underlined characters in the words have the same phonetic but different semantic components.

Mothers' education

Mothers' education level was measured on a 7-point scale with 1 as 3rd grade or below, 2 as 4th grade to 6th grade, 3 as grades 7 to 11, 4 as grades 12 to 13 (the last two grades of high school), 5 as some college, 6 as university graduate, and 7 as postgraduate training.

Non-verbal reasoning

Set A and Set B from Raven's Standard Progressive Matrices (RCPM; Raven, Court, & Raven, 1995) were used as an estimate for children's non-verbal reasoning. There were 24 items, and, thus, the maximum possible score on this task was 24.

Visual Spatial Relationships

The Visual Spatial Relationships task (Gardner, 1996) assesses children's spatial orientation. It includes sixteen items, with each consisting of five figures. Children were asked to select the target figure, which was, either partly or holistically, presented in a different orientation from the others. The maximum score of the task was 16.

Chinese character reading

Word reading was assessed using both the 150 two-character word list from the Hong Kong Test of Specific Learning Difficulties in Reading and Writing (HKT-SpLD) (Ho, Chan, Tsang, & Lee, 2000), combined with 61 words preceding these. The 61 words were either one or two-characters in length and were easier to read than the 150 words list. This task has been used in previous work (e.g., Lin et al., 2009). The words in each part were arranged with increasing difficulty levels. Children were asked to read from the beginning of the test, and the task was discontinued when children failed to read 15 consecutive items. One point was given for a correctly read item and the maximum possible score on this task was 211 points.

Chinese character writing

Children were asked to write 14 words (4 single-character words and 10 two-character words), ranging from very easy to fairly difficult, as shown in Appendix 2. All of these words were selected from standard textbooks for Hong Kong kindergarten and primary schools. All of these words were orally familiar to children, and the experimenter dictated the words twice loudly in Cantonese for each.

Throughout the task, children were encouraged to do their best to write down the characters they thought were correct. There are different ways to score word writing in Chinese given that most words are comprised of two or more characters and each character must be correctly identified individually (e.g., Tong et al., 2009). In the present study, we scored word writing by the character, such that one mark was allotted for each correctly written character; thus, the total score on this task was 24 points.

Phonological awareness

This task included items of both syllable and phoneme deletion to test children's phonological awareness. A similar task was used successfully among Hong Kong kindergarteners previously (McBride-Chang & Ho, 2000; McBride-Chang & Kail, 2002). There were 29 syllable deletion items (15 real words, 14 nonsense words) and 22 phoneme deletion items (14 single character words, 4 two-character nonsense words and 4 three-character nonsense words). Thus, the maximum possible score on this measure was 51 points.

Morphological awareness

The morphological construction task, similar to one tested in previous work (e.g., McBride-Chang, Shu, Zhou, Wat, & Wagner, 2003) was used to test children's morphological awareness. In this task, children are asked to combine familiar morphemes to create new compound words. In the task, 27 scenarios were presented orally in a three-sentence story form. For example, one scenario was "The scene we saw in the night from the top of the mountain is called a *night scene*. What would we

call the scene that is seen in the morning?” The correct answer would be “*morning scene*.” The maximum possible score on this task was 27 points.

Orthographical awareness

This task, used previously (Tong et al., 2009) to assess children’s awareness of the internal structures of Chinese characters, is comprised of 70 items with 30 real characters, 9 pseudocharacters, 21 noncharacters and 10 visual symbols. Each pseudocharacter was comprised of a novel combination of two radicals or components that still conformed to the conventional rules of Chinese character structure. Each noncharacter violated a conventional rule of Chinese character composition by putting a radical in an improper position, or adding or subtracting strokes from a real character. The visual symbols consisted of a variety of graphic or simple symbols. Children were visually presented with these items and were asked to indicate whether each item was a real character or non-character. One point was allotted for a correctly identified item, and the maximum score for this task was 70 points.

Procedure

Measures of maternal mediation, as well as children’s performances on tasks of phonological awareness, orthographic awareness, Raven’s non-verbal reasoning, and families’ demographic information were obtained individually at children’s homes. In contrast, Chinese character reading, Chinese character writing, morphological awareness and visual skill were tested at the kindergartens. The order of the home and school sessions was randomly varied across participants. During the home session, the maternal mediation task was administered first, typically lasting about 20 minutes.

Each mother was asked to help her child to write the required 12 two-character Chinese words “as she saw fit.” All videotapes were coded by a trained student coder who was blind to the study hypotheses. To assess the coding reliability, we had 13 cases (21%) double coded by another coder, and we obtained an inter-rater reliability of Kappa = .85.

The analysis unit was uniformly the character level. All dyads finished the joint writing task character by character. The same coding criteria were consistently applied to each Chinese character. Prior to the computation of maternal mediation scores, the frequencies of valid mediated characters for each child were recorded as the general raw score. Thus, in computing mothers’ scores in writing mediation, we calculated the percentages of each strategy that the mothers used as follows:

$$\frac{\text{Number of valid mediated characters under a particular strategy}}{\text{Total number of valid mediated characters (General raw score)}} \times 100\%$$

It should be noted that the seven strategies were conceptually independent of one another, which means that mothers could theoretically apply all these strategies to mediate a single character. For example, in writing the character 花 (flower), one mother simultaneously used the strategies of stroke, structure and semantic radical.

Moreover, we calculated the typical mediation level for each mother by selecting the strategy a mother used with the highest frequency. For example, if a mother’s mediation scores on these seven strategies of LM1, LM2, LM3, LM4, LM5, LM6 and LM7 were .54, .00, .38, .08, .00, .17, and .13, respectively, as calculated through the above formula, then the typical mediation score of this mother was 1, the stroke strategy (LM1). This is because the mother was more likely to use the stroke strategy

than any others, as indicated on her frequency scores. If two or more strategies shared the same highest frequency, the one with the most advanced level in the literate mediation scale was selected. In conducting correlation and regression analyses, typical mediation level was used to represent the maternal literate mediation score.

Results

Means, standard deviations, and reliabilities for all measures are shown in Table 1. For the literate mediation strategies, mothers tended to use largely stroke-focused and component segmentation strategies. The next most often used strategies were pointing out structure, semantic radical explanation, and character level mediation. Visualization and especially phonetic radical explanations were rarely used by mothers. The frequency of typical mediation levels indicated that among 63 mothers, 32 mothers predominately used the stroke strategy, 22 used the segmentation strategy, 4 used the structure strategy, 3 primarily used the semantic strategy, and 2 used the character-level mediation strategy. Thus, the mean of typical mediation score across all mothers was relatively low in the scale ($M = 2.32$ out of 7). The maternal education level (mean=3.73 out of 7) indicated that our participants were from families with a middle-level socio-economic status. The reliability for the maternal mediation task was the inter-rater reliability while all the other reported reliabilities were internal consistency reliabilities; all were at or above .69 in the present study.

Correlations among all variables included are presented in Table 2. Typical maternal mediation level was found to be significantly associated with Chinese word reading ($r = .58, p < .001$) and character writing ($r = .29, p < .05$), as well as some of

the cognitive/metalinguistic variables. In addition, Chinese character reading and writing were further found to be associated with visual skills and all the metalinguistic awareness measures. These correlation coefficients ranged from .24 to .50.

To examine further the extent to which cognitive components and maternal mediation contributed to Chinese character reading and writing, respectively, we conducted a hierarchical regression analysis. We first statistically controlled maternal education, children's non-verbal reasoning, and visual skills in step 1. We viewed these as general background (maternal education level) and cognitive skill controls. In step 2, phonological awareness, morphological awareness, and orthographical awareness, all important metalinguistic skills related to early reading development, were included and collectively explained 19% unique variance in Chinese character reading, $\Delta F(3, 52)=4.69, p<.01$ and 13% unique variance in Chinese character writing, $\Delta F(3, 52)=3.20, p < .05$). Finally, maternal mediation in step 3 further contributed 15% unique variance to Chinese word reading ($\Delta F(1, 51)=14.58, p<.001$), but only 1% unique variance in Chinese character writing ($\Delta F(1, 51)=.84, p=.37$). In this equation, the final beta weights showed that orthographic awareness ($t = 2.86, p < .01$) and maternal mediation ($t = 3.82, p < .001$) were the only unique significant correlates of Chinese word reading. Interestingly, however, for Chinese character writing, only phonological awareness emerged as a significant correlate ($t = 2.49, p < .05$).

Discussion

The present study focused on two main aspects of Hong Kong Chinese kindergartners' early literacy development. First, our findings further extended

previous work (Lin et al., 2009) on the cognitive strategies mothers use to help children in writing Chinese characters. Second, we demonstrated that this maternal mediation was uniquely important for reading acquisition, apart from metalinguistic and cognitive abilities previously demonstrated to explain early literacy development. However, maternal mediation was not uniquely associated with word writing, though phonological awareness was. These findings are discussed in more detail below.

To begin with, we replicated and extended previous work on a maternal mediation scale for parent-child joint writing. In terms of strategy focus, results demonstrated that stroke-focus and component segmentation strategies were most often used by mothers of these kindergartners, whereas visualization and phonetic radical strategies tended to be used least frequently. We found that the structure strategies and morphological strategies, focused on semantic radical explanations and character level mediation, were of middle frequency. Most important for extensions of this scale, the typical mediation level was strongly ($r=.58$) correlated with children's independent word reading, replicating previous findings on this scale (Lin et al., 2009). The correlation between typical level on this scale and children's independent word writing was also significant and moderate, extending previous work (Lin et al., 2009).

Maternal mediation reflects the unique features of the Chinese script as perceived by lay adults. For example, Chinese mothers tend to focus on stroke instruction and component segmentation, two aspects of writing not present in alphabetic languages. In addition, the importance of semantic radicals and morphemes as represented by

characters is also unique in Chinese. Notably, there were virtually no phonological strategies for any of the word-writing, as found previously in Hong Kong Chinese mother-child dyads (Lin et al., 2009). This is a dramatically different finding from previous work on alphabetic orthographies (e.g., Aram, 2007; Aram & Levin, 2001; 2002; 2004). Chinese characters are relatively unreliable in terms of phonological information (e.g., Cheung & Ng, 2003), and so a focus on phonological strategies may not be particularly helpful in facilitating Chinese children's literacy development. Meanwhile, excluding the copy strategy which reflects more on writing autonomy from the cognitive mediation scale enabled us to highlight and focus on other cognitive encoding and decoding strategies more sensitively.

Although our data were correlational only, the positive associations of our scale with both reading and writing suggest that higher-level maternal mediation strategies, which are more analytical, may actually help children to learn to read and write. As discussed based on previous research (Lin et al., 2009), findings suggest that for young Chinese children, the traditional rote memorization technique typically used in Chinese literacy teaching may be less useful than are more analytic techniques. Indeed, greater attention to Chinese writing involving exploiting the form and function of Chinese characters and similar intervention programs should perhaps be given in classrooms, as advocated previously for teaching older students (e.g., Packard, Chen, Li, Wu, Gaffney, Li, & Anderson, 2006). The argument that mother-child joint writing may actually promote literacy skills in young children is strengthened by the finding that the scale was uniquely associated with word reading

even with all other cognitive and metalinguistic skills statistically controlled.

Meta-linguistic awareness explained 19% and 13% unique variance for Chinese character reading and writing respectively, with children's non-verbal reasoning (Raven's), visual skills and maternal education level statistically controlled. Moreover, even with meta-linguistic awareness further controlled, maternal mediation explained 15% and 1% additional variance for Chinese character reading and character writing, respectively. The maternal mediation scale appears more strongly associated with children's independent word reading than word writing in this age group. It may be that word writing is relatively limited at this age, so that greater variability is evident in word reading than writing. However, in future studies, we plan to follow up this pattern to examine whether this trend continues as children develop over 1-2 more years. It is possible that early mother-child scaffolding of writing promotes subsequent independent writing development.

As found in some previous studies, the three metacognitive skills of phonological awareness, morphological awareness, and orthographic awareness explained unique variance in both Chinese reading and writing. In addition, with all abilities included in the final regression equations, orthographic awareness was found to be a unique predictor of Chinese character reading and phonological awareness to be a unique predictor in Chinese character writing. The orthographic awareness measure taps children's sensitivity to the internal form and structure of the character, which is particularly important for children's reading skill development (Shu & Anderson, 1997). In addition, a main teaching strategy in Hong Kong is the "look and say"

method for Chinese characters, which may focus children on the character shape or structure. Although both morphological awareness and phonological awareness measures were significantly correlated with Chinese word reading in the zero-order correlation table, these were not uniquely associated with word reading in the comprehensive regression equation. Interestingly, the phonological awareness measure was uniquely associated with word writing in the present study, however. The importance of phonological awareness for Chinese character writing may be attributable to the fact that there are many words in Chinese that overlap substantially phonologically (e.g., Chow, McBride-Chang, Cheung, & Chow, 2008; Shu, Chen, Anderson, Wu, & Xuan, 2003). Skill in isolating and identifying syllables may be particularly helpful for mapping these onto print. Similar results were found for beginning writing in a previous study of kindergartners in Hong Kong (Tong et al., 2009).

The correlation and hierarchical regression results suggested that maternal literate mediation may both directly and indirectly contribute to literacy skills. Such mediation likely focuses on print-meaning associations. For example, maternal literate mediation may improve literacy skills by facilitating orthographic awareness. With mothers' help in scaffolding their writing, children can learn to deconstruct characters into different components and then transfer this knowledge across different words. Tan et al.(2005) also noted that writing practice of Chinese children ages 7-10 years is strongly linked to reading ability, partially via the role of orthographic awareness. The importance of orthographic awareness for early Chinese reading and writing skills has

been noted in a number of previous studies (Li et al., 2006; Packard et al., 2006; Shu & Anderson, 1997). In addition, maternal mediation may also help to develop morphological awareness, either by stimulating understanding of the role of semantic radicals in print (e.g., Shu & Anderson, 1997; Wu, Anderson, Li, Chen, & Meng, 2002) or by focusing on the morpheme (i.e., character) level, a focus which facilitated improved reading skills in previous work (Chow et al., 2008).

Apart from these possible indirect mechanisms, maternal mediation also had a direct association with Chinese reading in the present study. Mothers likely serve to facilitate both learning and memory for Chinese characters. For example, one mother employing simultaneously the component segmentation and semantic radical functional explanation strategies to explain 蜜 (honey) in 蜜蜂 (bee) said, “An insect (虫) is collecting honey (蜜) with her heart (心), stores it at home (宀), and seals it with a cover (冫).” The way of making all components (虫, 心, 宀, 冫) of the character 蜜 (honey) into a story largely facilitates the child’s memorization of the character and ensures its easier retrieval in the future. It should be noted that although this experimental mother-child writing situation was introduced by us for the purpose of this study, we assume it is representative of many encounters over extended time periods involving maternal scaffolding of an involved literacy-learning process.

There were at least three limitations of the present study. First, our data were correlational only. Thus, causal associations between maternal mediation and children’s literacy skills could not be determined. We plan a follow-up longitudinal

study on this issue, particularly to examine whether the stronger association of joint mother-child writing for word reading, as compared to word writing, will change with development. Second, although we discussed both indirect and direct effects of maternal mediation in relation to metalinguistic skills, we only tested the direct effects statistically. With a larger sample, more sophisticated statistical analyses, such as path analyses, might be carried out to test for partial and full mediation between joint mother-child writing and metalinguistic skills. Finally, the present study did not analyze additional aspects included in mother-child joint writing activities, such as print mediation (e.g., Aram & Levin, 2001; Lin et al., 2009), or social interactions, including emotional atmosphere or mothers' beliefs, which might also be related to children's literacy skills (e.g., Korat & Levin, 2002). These questions may be explored in future studies.

The present study has expanded our knowledge of home literacy acquisition, particularly the role of writing, in young children. We have demonstrated the utility of a literate mediation scale for Chinese mother-child dyads. This scale can uniquely account for variability in children's independent word-reading apart from other metalinguistic skills and is also significantly correlated with word writing. Findings underscore the importance of mothers' early scaffolding in facilitating children's literacy acquisition.

References

- Aram, D. (2007). Maternal writing mediation to kindergartners: Analysis via a twins study. *Early Education and Development*, 18(1), 71-92. DOI: 10.1080/10409280701274733

- Aram, D., & Levin, I. (2001). Mother-child joint writing in low SES: Sociocultural factors, maternal mediation and emergent literacy. *Cognitive Development, 16*, 831-852. DOI: 10.1016/S0885-2014(01)00067-3
- Aram, D., & Levin, I. (2002). Mother-Child joint writing and storybook reading: Relations with literacy among low SES kindergartners. *Merrill Palmer Quarterly, 48*, 202-224.
- Aram, D., & Levin, I. (2004). The role of maternal mediation of writing to kindergartners in promoting literacy achievements in second grade: A longitudinal perspective. *Reading and Writing: An Interdisciplinary Journal, 17*, 387-409. DOI: 10.1023/B:READ.0000032665.14437.e0
- Burns, M. S., & Casbergue, R. (1992). Parent-child interaction in a letter-writing context. *Journal of Reading Behavior, 24*(3), 289-312.
- Chao, R. K., & Tseng, V. (2002). Parenting of Asians. In M. H. Bornstein (Ed.), *Handbook of parenting: Vol. 4: Social conditions and applied parenting* (2nd ed., pp. 59-93). Mahwah, NJ: Lawrence Erlbaum Associates.
- Cheung, H., & Ng, K. H. (2003). Chinese reading development in some major Chinese Societies: An introduction. In C. McBride-Chang & H.-C. Chen (Eds.), *Reading development in Chinese children*. Westport, CT: Greenwood.
- Chow, B. W.-Y., McBride-Chang, C., Cheung, H., & Chow, C. (2008). Dialogic reading and morphology training in Chinese children: Effects on language and literacy. *Developmental Psychology, 44*, 233-244. DOI: 10.1037/0012-1649.44.1.233

- Gardner, M. F. (1996). *Test of visual-perceptual skills (n-m) revised*. New York: Psychological and Educational Publications.
- Huang, H. S., & Hanley, J. R. (1994). Phonological awareness and visual skills in learning to read Chinese and English. *Cognition*, 54, 73-98. DOI: 10.1016/0010-0277(94)00641-W
- Ho, D. Y. F. (1996). Filial piety and its psychological consequences. In M. H. Bond (Eds.). *The handbook of Chinese psychology* (pp. 155_165). Hong Kong: Oxford University Press.
- Ho, C.S.-H., & Bryant, P. (1999). Different visual skills are important in learning to read English and Chinese. *Educational and Child Psychology*, 16, 4-14.
- Ho, C. S.-H., Chan, D. W. -O., Lee, S.-H., Tsang, S.-M., & Luan, V. H. (2004). Cognitive profiling and preliminary subtyping in Chinese developmental dyslexia. *Cognition*, 91, 43-75. DOI: 10.1016/S0010-0277(03)00163-X
- Ho, C. S.-H., Chan, D. W.-O., Tsang, S.-M., & Lee, S.-H. (2002). The cognitive profile and multiple deficit hypothesis in Chinese developmental dyslexia. *Developmental Psychology*, 38, 543-553. DOI: 10.1037//0012-1649.38.4.543
- Ho, C. S.-H., & Bryant, P. (1997). Phonological skills are important in learning to read Chinese. *Developmental Psychology*, 33, 946-951.
- 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.). *Chinese children's reading development* (pp. 51-71). New Haven, CT:

Praeger.

Hong Kong Education Department (1996). *Guide to the pre-primary curriculum*.

Hong Kong: Author.

Korat, O., & Levin, I. (2002). Spelling acquisition in two social groups:

Mother-child interaction, maternal beliefs and child's spelling. *Journal of Literacy Research*, 34(2), 209-236. DOI: 10.1207/s15548430jlr3402_5

Li, H., Peng, H., & Shu, H. (2006). A study on the emergence and development of Chinese orthographic awareness in preschool and school children. *Psychological Development and Education*. 18(1), 35-38. (In Chinese)

Li, H., & Rao, N. (2000). Parental influences on Chinese literacy development: A comparison of preschoolers in Beijing, Hong Kong, and Singapore. *International Journal of Behavioral Development*, 24, 82-90. DOI: 10.1080/016502500750038026

Lin, D., McBride-Chang, C., Aram, D., Levin, I., Cheung, R. Y. M., Chow, Y. Y. Y., & Tolchinsky, L. (2009). Maternal mediation of writing in Chinese children. *Language and Cognitive Processes*, 24 (7), 1286-1311. DOI: 10.1080/01690960801970615

McBride-Chang, C., & Ho, C. S-H. (2000). Predictors of beginning reading in Chinese and English: A 2-year longitudinal study of Chinese Kindergartners. *Scientific Studies of Reading*, 9, 117-144. DOI: 10.1037//0022-0663.92.1.50

McBride-Chang, C., & Kail, R. (2002). Cross-cultural similarities in the predictors of reading acquisition. *Child Development*, 73, 1392-1407.

DOI:10.1111/1467-8624.00479

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. DOI:

10.1037/0022-0663.95.4.743

Meisels, S. J. (1998, September). *Assessing readiness: How should we define*

readiness? (Report No. R307A60004). Chapel Hill, NC: Office of Educational

Research and Improvement. (ERIC Document Reproduction Service No. ED

437 158)

Packard, J. L., Chen, X., Li, W., Wu, X., Gaffney, J. 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*, 19,

457-487. DOI: 10.1007/s11145-006-9003-4

Raven, J. C., Court, J. H., & Raven, J. (1995). Raven's Coloured Progressive

Matrices. UK: Oxford Psychologists Press.

Shu, H., & Anderson, R. C. (1997). Role of radical awareness in the character and

word acquisition of Chinese children. *Reading Research Quarterly*, 32, 78-89.

DOI: 10.1598/RRQ.32.1.5

Shu, H., & Anderson, R. C. (1998). Learning to Reading Chinese: The

Development of Metalinguistic Awareness. In J. Wang, A. W. Inhoff, & H-C.

Chen (Eds.) *Reading Chinese script: A cognitive Analysis*, pp. 1-18.

- 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. DOI: 10.1111/1467-8624.00519
- Siok, W. T., & Fletcher, P. (2001). The role of phonological awareness and visual-orthographic skills in Chinese reading acquisition. *Developmental Psychology*, 37, 886-899. DOI:10.1037/0012-1649.37.6.886
- Tong, X., McBride-Chang, C., Shu, H., & Wong, A. (2009). Morphological awareness, orthographic knowledge, and spelling errors: Keys to understanding early Chinese literacy acquisition. *Scientific Studies of Reading*, 13 (5), 426-452. DOI: 10.1080/10888430903162910
- Tan, L.H., Spinks, J.A., Eden, G., Perfetti, C.A., & Siok, W.T. (2005). Reading depends on writing, in Chinese. *PNAS*, 102, 8781-8785.
- Vygotsky, L. S. (1978). *Mind in society: The development of higher psychological processes*. Cambridge, MA: Harvard University Press.
- Wu, X., Anderson, R. C., Li, W., Chen, X. and Meng, X. (2002). Morphological instruction and teacher training. In W. Li, J. S. Gaffney and J. L. Packard (Eds), *Chinese children's reading acquisition*.
- Wu, X., Li, W., & Anderson, R. C. (1999). Reading instruction in China. *Journal of Curriculum Studies*, 31, 571-586. DOI: 10.1080/002202799183016

Table 1 *Means, standard deviations, and reliabilities for all measures.*

Measures (maximum score possible)	Mean	Standard Deviation	Reliability
LM1 (stroke)	.50	.25	--
LM2 (visual)	.08	.12	--
LM3 (component)	.42	.19	--
LM4 (structure)	.14	.17	--
LM5 (phonetic radical)	.001	.01	--
LM6 (semantic radical)	.11	.13	--
LM7 (character)	.19	.14	--
Typical mediation level (7)	2.32	1.61	.85
Chinese character reading (211)	66.52	31.95	.98
Chinese character writing (24)	7.30	3.18	.74
Raven's (24)	13.38	3.28	.69
Maternal education (7)	3.73	1.23	--
Visual spatial relationships (16)	11.46	2.98	.71
Phonological awareness (51)	22.78	10.13	.94
Morphological awareness (27)	12.46	4.94	.86
Orthographic awareness (70)	42.43	8.55	.81

Note. $N=63$. All reliabilities listed are internal consistency reliabilities except for the typical mediation level, which was measured as inter-rater reliability.

Table 2

Correlations among visual skills, phonological awareness, morphological awareness, orthographic awareness, maternal mediation, and Chinese character reading and writing

Variables	1	2	3	4	5	6	7
1. Chinese character reading	-						
2. Chinese character writing	.72***	-					
3. Visual spatial relationship	.36**	.41**	-				
4. Phonological awareness	.35**	.50***	.36**	-			
5. Morphological awareness	.24 †	.30*	.27*	.34**	-		
6. Orthographic awareness	.49***	.32*	.36**	.25*	.27*	-	
7. Typical mediation level	.58***	.29*	.26*	.08	.21 †	.28*	-

Note: † $p < .10$, * $p < .05$; ** $p < .01$; *** $p < .001$

Table 3

Hierarchical Regression Explaining Chinese Character Reading and Chinese Character Writing from meta-linguistic awareness and

Step	Variables	Chinese character reading				Chinese character writing			
		Beta	t	R ²	R ² change	Beta	t	R ²	R ² change
1.	Mother's education	-.03	-.29	.13	.13	-.03	-.26	.18	.18
	Non-verbal IQ	-.00	-.01			.07	.47		
	Visual skills	.06	.50			.14	1.01		
2.	Phonological awareness	.22	1.82†	.31	.19	.34	2.49*	.31	.13
	Morphological awareness	-.04	-.38			.09	.69		
	Orthographic awareness	.33	2.86**			.10	.76		
3.	Typical mediation level	.42	3.82***	.46	.15	.11	.91	.32	.01

Note: † $p < .10$, * $p < .05$; ** $p < .01$; *** $p < .001$

Level 1 (stroke). Mother focuses on strokes within the character. For example, a mother says that a long line should go here.

Level 2 (visualization). Mother employs visual cues to help the child to visualize the character.

For example, a mother points out that the right side of 孔 is visually similar to L.

Level 3 (segmentation). Mother segments a Chinese character into components. For example, a mother says that 李 is composed of both 木 and 子.

Level 4 (structure). Mother refers to the character's structure. For example, a mother says that 李 is a top-down structure.

Level 5 (phonetic function). Mother relates Chinese characters to phonetic information. For example, a mother reminds her child that two similarly pronounced characters, 蜂 (bee) and 峰 (peak), contain the same phonetic component because they sound similar 峯.

Level 6 (semantic function). Mother points out the meaning of a given semantic radical. For example, a mother says that the left side of 蜂 (bee) is 虫 (insect) meaning "bee" because this character represents a particular kind of insect.

Level 7 (character level). Mother relates the character to other characters or words. For example, in writing 蜜 in the word 蜜蜂 (bee), a mother says that this is the same character as the 蜜 in the word 蜂蜜 (honey) the child just wrote.

Figure 1: Refined Literate Mediation Scale

Word	Character	Semantic radical	Phonetic radical	Structure
花瓶(vase)	花(flower)	艹	化	top-down
	瓶(bottle)	瓦	并	left-right

Description of the word 花瓶 (vase):

The word 花瓶 (vase) is made up of the characters 花 (flower) and 瓶 (bottle). The character 花 (flower) is composed of the semantic radical 艹 meaning a kind of plant, and the phonetic radical 化 indicating the sound of the character 花 (flower); both are pronounced as “hua”. For the other character 瓶 (bottle), the semantic radical is 瓦 meaning a kind of earthenware and the phonetic radical is 并 indicating the sound of 瓶 (bottle). 花 (flower) is structured as top-down with the semantic radical above and phonetic radical at the bottom, whereas 瓶 (bottle) is left-right structured with the semantic radical at the right and the phonetic radical on the left.

Figure 2 Examples of Chinese Word Decomposition

Appendix 1: Chinese two-character words presented in maternal mediation task

Order	Chinese Words	English Translation	Category (5 Categories)	Matched Pair
1	孔雀	Peacock	Homophone	(1) 孔雀 -- (9) 恐龍
2	蘋果	Apple	Homophone	(2) 蘋果 -- (7) 花瓶
3	免費	Free	Visually similar character	(3) 免費 -- (5) 兔子
4	他們	they (male)	Same phonetic component/ Different semantic component	(4) 他們 -- (11) 她們
5	兔子	Rabbit	Visually similar character	(5) 兔子 -- (3) 免費
6	蜜蜂	Bee	Reverse-ordered character	(6) 蜜蜂 -- (12) 蜂蜜
7	花瓶	Vase	Homophone	(7) 花瓶 -- (2) 蘋果
8	行李	Luggage	Homograph	(8) 行李 -- (10) 銀行
9	恐龍	Dinosaur	Homophone	(9) 恐龍 -- (1) 孔雀
10	銀行	Bank	Homograph	(10) 銀行 -- (8) 行李
11	她們	They (female)	Same phonetic component/ Different semantic component	(11) 她們 -- (4) 他們
12	蜂蜜	Honey	Reverse-ordered character	(12) 蜂蜜 -- (6) 蜜蜂

Appendix 2: Words presented in the writing task

Order	Chinese characters	English Translation
1	口	mouth
2	八	eight
3	馬	horse
4	雲	cloud
5	王子	prince
6	公主	princess
7	手指	finger
8	止血	stanching
9	晴天	sunny
10	讀書	reading
11	眼睛	eye
12	起來	getting up
13	音樂	music
14	蘭花	orchid