Maternal Mediation of Writing in Young Children: A Comparison between Hong Kong and Beijing

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Abstract

This dissertation consisted of three studies investigating the nature of maternal mediation of writing among kindergarten and first grade children and their mothers across the two prominent Chinese societies of Hong Kong and Beijing and further examined the associations of maternal mediation of writing with cognitive /metalinguistic abilities and literacy skills in Chinese cross-culturally. In Study 1, two scales of literate mediation and print mediation based on mother-child writing interactions were created and refined. These scales, developed following work on Hebrew by Aram and Levin (2001; 2004), were modified and tested among 67 Hong Kong mother-child dyads from three grade levels -- second year kindergarten, third year kindergarten, and first grade. The results showed that mothers' use of lower-level memorization strategies tended to be negatively associated with their children's reading skills, whereas mothers' higher level analytic scaffolding strategies were positively correlated with reading skills, even with age, grade level, nonverbal reasoning, and maternal education statistically controlled.

In Study 2, I further refined these scales and created an additional measure of commentary mediation, reflecting, in part, socio-emotional-regulation aspects of the writing interaction process. Across both Hong Kong and Beijing, these three measures of literate mediation, print mediation, and commentary mediation, were examined in relation to cognitive/metalinguistic awareness skills and Chinese reading and writing skills in three groups of children and their mothers. These groups included 63 Hong Kong third year kindergartners, 43 Beijing third year kindergartners, and 49 Beijing

first graders. Results of Study 2 showed that mothers of kindergarten children tended to use lower level mediation strategies, such as stroke and component segmentation, and allowed less autonomy during the joint writing process. In contrast, mothers of first graders tended to use higher level mediation strategies, such as character level mediation, and allowed more autonomy, during this process. Results of the commentary mediation analyses demonstrated that Hong Kong mothers offered more negative than positive responses compared to Beijing mothers, particularly for kindergartners. In addition, the literate mediation and print mediation scale scores were significantly correlated with Chinese reading and writing in both Hong Kong and Beijing K3 children, but not in Beijing first graders. Scores on the literate mediation scale explained 11% to 25% unique variance in literacy skills in Beijing K3 children and reading skills in Hong Kong K3 children, even with maternal education, nonverbal reasoning, visual skills and metalinguistic awareness statistically controlled. In Hong Kong K3 children, children's orthographic awareness partially mediated the relation between literate mediation and Chinese word reading. Of all commentary mediation measures included, only the process mediation measure, focused on specific comments toward children's effort or strategies, was found to be uniquely associated with Chinese word reading and writing in Hong Kong K3 children and significantly related to Chinese word reading in Beijing K3 children with children's age, nonverbal reasoning and maternal education statistically controlled. Study 3 extended and tested the maternal mediation measure to Pinyin writing in Beijing K3 children. Maternal Pinyin mediation was uniquely associated with Chinese word

reading even apart from children's general cognitive skills, maternal education, and phonological awareness.

The present research was among the first attempts to analyze the nature of maternal mediation of writing in Chinese and its association with literacy skills. The findings highlight the importance of maternal mediation of writing in preschool children's independent literacy development in Chinese across Hong Kong and Beijing.

摘要

该论文于三个研究中探讨了北京香港两地母亲对儿童的书写辅导策略，以及各种书写辅导策略与儿童元语言意识和独立读写能力之间的关系。首先，研究 1 通过考察各种书写辅导策略与儿童阅读能力的关系，建立了两个书写辅导量表。其一为书写编码量表，包括注重笔顺、形象、部首分割、结构、形旁、声旁和字间比较等七种策略，并且辅导水平依次从低到高排列；其二是书写自由度量表，包括母亲抓写、一部分一部分抄写、整体抄写，无模型口头指导书写，仅监督鼓励等策略，同样辅导自由度依次从低到高排列。研究 2 增加分析了母亲的辅导反馈，并比较了京港两地母亲在辅导编码、辅导自由度和辅导反馈三方面的异同，同时更进一步考察了他们与儿童元语言意识和读写能力发展的关系。结果表明，香港母亲比北京母亲更多的使用笔顺和形象等策略，却少用形旁以及字间比较等策略。香港母亲更多的出现批评否定等反馈信息。同时，研究 2 表明，即使在统计上控制了基本背景信息和儿童元语言意识，在京港两地均发现书写编码量表与儿童独立阅读书写能力显著正相关。而自由度辅导量表则仅在北京儿童中发现与儿童读写能力显著正相关。研究 3 扩展探讨了母亲拼音书写辅导与儿童读写能力之间的关系，结果表明，采用深层分析性地提取分解语音、音位与儿童阅读能力呈显著正相关。基于以上结果，该论文表明了有效的书写辅导策略对学前儿童读写能力发展的重要作用。同时，此结果对中文语文教学有一定得启示意义。

Chapter One Introduction

The vast majority of literacy research (e.g., Ho & Bryant, 1997a, 1997b; Huang & Hanley, 1995; Li, Peng, & Shu, 2006; McBride-Chang, Shu, Zhou, Wat, & Wagner, 2003; Shu & Anderson, 1998; Tong, McBride-Chang, Shu, & Wong, in press) has focused on relations between children's various cognitive /metalinguistic abilities and literacy skills. However, relatively little attention has been paid to the influence of parent-child interaction on children's literacy development. Those limited studies on observations of parent-child interactions, interviews with parents /caregivers, and assessments of literacy /language skills have added to our knowledge of the strong impact of parent-child interaction on literacy development.

This dissertation focuses on the development of scales of mother-child shared writing in Chinese families and compares these across two prominent Chinese cultures, Hong Kong and Beijing. In addition, the dissertation investigates the associations of maternal mediation of writing with cognitive/metalinguistic awareness and literacy skills. In this introduction, a theoretical background and framework of parent-child interaction characteristics are first presented. Next, research on parent-child interactions, particularly focusing on collaborative writing, and literacy development are critically discussed. Finally, maternal mediation of writing in Chinese and the proposed studies and corresponding hypotheses are presented. Because a central focus of this dissertation involved the concept of scaffolding, I begin with an introduction to Vygotsky's (e.g., 1978) views of children and parent-child interactions.

Vygotsky's cultural historical activity theory (CHAT)

Vygotsky (1978) viewed children's development as embedded within a sociocultural context. According to Vygotsky, children can develop optimally when interacting with a more skilled partner and their potential for development depends upon their "zone of proximal development". This zone is defined as the distance between what the child can do independently and what the child can accomplish with careful assistance of another more skilled person, such as a parent, teacher, or peer. That distance is where development could be promoted and where parents should mediate or assist in carrying out any particular task. In addition, Vygotsky proposed the idea of "scaffolding" in assisting or guiding children within the proximal development zone. Scaffolding is characterized as joint participation, encouragement, feedback, monitoring and maximizing children's participation. Although Vygotsky's followers expanded and developed his theory (e.g., Griffin & Cole, 1984; Rogoff & Gardener, 1984), Vygotsky's core concepts of "zone of proximal development" and "scaffolding" have largely remained the same since his introduction of them.

Thus, although Vygotsky's work is now decades old, his ideas are still widely studied. Winsler (2003), for example, found that there were 721 works in ERIC and PSYCHINFO databases that emerged from entering the key words of "Vygotsky and education" from 1973 to 2003. Of these, 70% of the work had emerged in the latest decade of 1993 to 2003. Those studies covered various topics including assessment, computer/technology, cultural variation/multicultural education, second language learning, general/theoy/overview, literacy/reading, math education, moral education,

peer interaction, play, private speech/language for self-regulation, science education, school readiness, special education/inclusion, teacher-child interaction, and teacher education (Winsler, 2003). Numerous empirical studies have confirmed and expanded the notion that adult-child interaction and scaffolding are important for child development.

Family may be the most salient environment for adult-child interaction and scaffolding to take place in early children's development. Previous research has established some foundations for the study of parent-child interactions (Neitzel & Stright, 2003). I elaborate them below.

Framework for characterizing parent-child interaction

Some studies have investigated parent-child interactions without distinguishing mothers and fathers (e.g., Burns & Casbergue, 1992; DeBaryshe, Buell, & Binder, 1996), but some other studies (e.g., Aram & Levin, 2001; Neitzel & Stright, 2003) have examined the parent-child interaction specifically from the mothers' perspective. As found in previous studies, compared to fathers, mothers play a more important role in home literacy education in both western (Meisels, 1998) and eastern (Chao & Tseng, 2002; Ho, 1996) societies. Fathers are more likely to engage in play activities with their children, whereas mothers tend to help with children's schoolwork (Parke & Buriel, 1998). In addition, different parental roles were identified in both western culture (e.g., Collins & Russell, 1991, Russell & Russell, 1987) and Chinese culture (e.g., Ho, 1981, Hsu, 1985). For example, Chinese mothers tend to be described as *chi2* (kind) and Chinese fathers as *yan2* (strict). To reduce the confounding between

mothers and fathers, in this dissertation, I, therefore, focused on mothers' help in Chinese writing only.

Neitzel and Stright (2003) defined the fundamental dimensions of mother-child interaction as being those of cognitive support, autonomy support, and social emotional support. These three dimensions are categorized as independent of one other, and jointly related to children's general competencies in self-regulation (Grolnick & Ryan 1989; Stright, Neitzel, Sears, & Hoke-Sinex, 2001) and cognitive abilities (Wood, Bruner & Ross, 1976).

Cognitive support

Cognitive support refers to mothers' specific task-related strategic instructions, including breaking down the task, clarifying the demands, and reducing task difficulties during parent-child interaction. Neitzel and Stright (2003) distinguished two aspects of cognitive support, i.e., metacognitive content and manner of instruction. Metacognitive content covers ideas such as talking about how this task works and task management strategies or techniques. Instruction manners include mothers' efforts in simplifying the task, breaking the task into small steps, and reviewing those steps.

Cognitive support was found to be associated with children's cognitive related behaviors. Appropriate instruction support typically reduces the cognitive load of the task and, thus, maximizes children's benefit for improvement. For example, Neitzel and Stright (2003) investigated the interaction of mothers and their preschool children in four problem-solving tasks, and found that the more the mother provided meaningful instruction in manageable steps, the better children's academic and

self-regulation competences were. Similarly, Rogoff, Mistry, Goncu and Mosier (1993) found that mothers' providing of instruction in small steps with frequent review facilitated children's application in later academic management strategies. In addition, studies of mother-child interactions on a word-writing task (Aram & Levin, 2001; 2004) demonstrated that the more specific and analytic mothers were in approaching and facilitating a writing task, the better children's performance on reading and writing skills were. In contrast, improper cognitive support, such as demanding instruction, does not promote children's advanced cognitive behavior (Stright et al., 2001).

Autonomy support

The second fundamental dimension of mother-child interactions, as highlighted by Neizel and Stright (2003), is autonomy support. Autonomy support captures mothers' efforts to make children active and independent learners in the mother-child interaction. It focuses on "when" to help. Neitzel and Stright (2003) categorized autonomy support in relation to two aspects, i.e., overcontrol and encouragement of the child's active role. Overcontrol is assessed based on whether or not a mother exercises control over her child beyond what is necessary for the child to carry out the task. For example, when a child can already complete a task independently, but the mother still controls the child's pace according to her instructions, this would be a case of overcontrol. Encouragement of a child's active role involves instances in which a mother encourages the child to carry out the task as actively as possible. For example, in asking a question, a mother asks what and how questions (i.e., questions

that maximize the child's output as much as possible) appropriately in order to get the child to be involved actively.

Parents' autonomy support strategies have been found to be associated with children's own behavior control (Pianta, Smith, & Reeve, 1991) and academic performance (Grolnick & Ryan, 1989). Low levels of autonomy may lead children to regard themselves as passive recipients and to feel little responsibility in the task. In contrast, a high level of autonomy may allow children to engage in the task actively, thus facilitating their performance on the task. For example, Aram and Levin (2001, 2004) showed that high writing autonomy in mother-child interactions facilitated children's reading and writing development among Israeli kindergartners and their mothers.

Social emotional support

The third dimension of mother-child interactions as outlined by Neitzel and Stright (2003) is social emotional support. With the effortful process of cognitive support emphasizing with the specific instruction of "how" to carry out a given task and autonomy support focusing on "when" to assist children on that task, social emotional support focuses on cultivating children's motivation for the task. Basically, social emotional support refers to parents' comments/responses/feedback on children's behavior or performance. Neitzel and Stright (2003) further divided social emotional support into two aspects of rejection and encouragement. Rejection includes disapproval, criticism, dismissal of the child's efforts, or other negative or inappropriate reactions to the child, whereas encouragement included positive

feedback or supportive comments about children's ability or performance on the task.

Bandura (1986) stated that self regulation behavior is the product of the balance between a child's "skill and will." Thus, social emotional support plays an important role in fostering children's will, facilitating task persistence. In one study by Feldman, Martinez-Pons, and Shaham (1995), social emotional support was found to be directly related to academic self-regulation behavior. Moreover, Stright et al. (2001) suggested that children whose mothers exerted more emotional support were more likely to express their thoughts in class. Further, Pomerantz, Wang, and Ng (2005) highlighted the importance of mothers' affect in children's motivational and emotional functioning development while interacting with children in the homework context among children ages 8 to 12 years. Their motivational functioning was measured as children's self-reports of intrinsic and extrinsic motivation of academic goals, and an emotional functioning measure consisting of both a negative dimension, including unpleasant emotions, depressive symptoms, and anxiety symptoms and a positive dimension, including pleasant emotions, life satisfaction, and self-esteem. The results suggested that mothers' negative affect was associated with poor motivational and emotional functioning whereas positive affect protected children's motivational and emotional functioning.

Together, these dimensions of cognitive support, autonomy support, and social emotional support as described by Neitzel and Stright (2003) well define the characteristics of parent-child interactions. These three dimensions further provide a clear theoretical framework for systematically analyzing the nature of parent-child

interactions particularly in the context of literacy development involving shared writing.

Parent-child interaction focusing on writing

There are numerous research studies investigating the relations of parent-child interactions to children's various outcomes, including academic achievement (e.g, Grolnick, Gurland, DeCourcey, & Jacob, 2002; Ng, Pomerantz, & Lam, 2007), motivation (e.g., Mueller & Dweck, 1998), self-worth and coping (e.g., Kamins & Dweck, 1999), and self-regulation (e.g., Neitzel & Stright, 2003; Stright et al., 2001). In these previous studies, most used problem-solving tasks to capture the mother-child interaction process. Although there is a growing body of studies focusing on the relations of mother-child interactions to children's literacy development, most of those studies have investigated parent-child interaction in a shared book reading task (e.g., Blewitt, Rump, Shealy, & Cook, 2009; Chow, McBride-Chang, Cheung, & Chow 2008; Sénéchal, LeFevre, Hudson, & Lawson, 1996). In contrast, relatively few studies have investigated the relation between parent-child collaborative writing activities and children's literacy acquisition (Aram, 2007; Aram & Levin, 2001; 2002, 2004; Burns & Casbergue, 1992; DeBaryshe, Buell, & Binder, 1996; Korat & Levin, 2001, 2002).

Studies on home observation related to children's literacy development have found that children sometimes question their parents on what they are reading and writing, and parents are often involved in writing activities with their children (Baker, Fernandez-Fein, Scher & Williams, 1998; Bissex, 1980; Gundlach, McLane, Stott &

McNamee, 1985; Hall, 2000; Harste, Woodward & Burke, 1984; Saracho, 1999; Teale, 1986). However, most of these research studies were not clear on how mothers and children exchange information and how these interactions might be related to children's independent literacy development.

One study that did explore this issue was carried out by Burns and Casbergue (1992), who analyzed parent-child interactions in the context of English letter-writing (defined as writing messages to other people) among 3- to 5-year-olds and examined how parental control was relate to children's behaviors in the interaction. The ten-minute interaction was videotaped and later coded on three aspects of the manner and type of information exchanges and children's writing input into the letter products. Results showed that higher levels of parents' control tended to be associated with children who exhibited high levels of responses, had good communication with parents focusing on spelling, and were more conventional in the products of their writing. In contrast, low levels of parent control tended to be associated with children who had higher levels of initiations and verbal input, focused their communication with parents on letter content, and had more emergent level products. These analyses offered more detailed information about children's writing output in relation to parental control.

With Burns and Casbergue's (1992) analyses of parental mediation focusing on this control aspect, DeBaryshe, Buell, and Binder (1996) examined parent-child interactions focusing on social aspects of interaction, especially verbal conversations, in the same English letter-writing context among 5 to 6 years olds. They demonstrated

that the more interactive the talk was between parents and children, the better the quality of the dyadic letter product turned out to be. Through a qualitative analysis of the dyadic interaction, the study also suggested that mothers were sensitive to children's developmental progression of writing skills. However, each of these two studies only focused on one aspect of parental mediation, i.e., control or social aspects of interaction. They did not systematically capture or organize more than one possible dimension characterizing parent-child interaction. More importantly, children's independent literacy skills were not taken into account in these two research studies.

Recently, Aram, Levin and their colleagues investigated the relation of maternal writing mediation to children's independent literacy acquisition in a series of studies in Israel. Their approach to shared parent-child writing and their findings formed an important foundation for all studies described in this dissertation. Korat and Levin (2001) examined the relations among mother-child collaborative writing, maternal beliefs about pedagogy and child as learner, and children's independent writing in two socioeconomic status (SES) groups in Israeli second grader-mother pairs. They captured the mother-child interactions in the context of writing a party invitation and shopping list. However, they analyzed the interactions of the dyads by focusing on children's display of autonomy rather than from their mothers' perspective. For example, they measured how often a child initiated the topic and lead the topic with the mother. The results showed moderately high correlations among parental beliefs, children's autonomy in the interactions, and children's independent writing skills, especially in the low SES group. Later, in a study by Korat and Levin (2002), it was

found that children's writing skills were related to the degree of spelling/writing details discussed in the interaction in the same sample.

These studies of parent-child writing interactions described above (Burns & Casbergue, 1992; DeBaryshe, Buell, & Binder, 1996; Korat & Levin, 2001; 2002) examined parent-child interactions in the context of particular activities, i.e., writing letters to others, party invitations, or shopping lists. Although ecologically valid and intrinsically interesting for the dyads, these were admittedly fairly nonstructured writing activities. A lack of structure may limit researchers' abilities to fully test the nature of maternal mediation of writing itself, which is assumed to focus on "how to write" rather than "what to write." The foundation of writing activities is first to learn how to write words. Once word writing is established, then children can move on to further write more complicated shopping lists, letters to others, etc. Thus, perhaps the first steps of maternal writing mediation are better to focus on the mechanism of writing words, which is likely to better reflect the nature of maternal mediation of writing. For example, how a mother retrieves a syllable/phoneme to facilitate her child's writing is a specific, targeted aspect of word writing. In contrast, nonstructured writing activities are likely to lead parent-child dyads to focus more on what to write, including punctuation marks, salutations, or even drawing pictures for writing a letter, rather than how to write actual words. Perhaps for this reason, the analyses of mother-child interactions in the context of shared writing have focused largely on autonomy/control and social dimensions, but less on cognitive dimension of this collaborative process. Thus, perhaps structured writing activities could better reflect

the nature of parent-child interaction of writing, i.e., "how to write".

In part to focus more on cognitive elements of shared writing, for both structured specific words and an unstructured party invitation writing interaction context, Aram and Levin (2001) studied the relation of maternal mediation of writing to word writing and recognition, phonological awareness, and orthographic awareness beyond sociocultural factors among the dyads of Israeli 5-year-old children and their mothers. The videotaped maternal mediation process was coded into two scales of literate mediation, capturing maternal cognitive support and print mediation reflecting mothers' autonomy support, respectively. The results of this study showed that the quality of maternal mediation predicted word writing and recognition, and phonological awareness, but not orthographic awareness, even controlling for sociocultural factors. Following this study, these researchers further longitudinally examined the predictive power of maternal mediation for children's literacy development (Aram & Levin, 2004). They tested the same participants two and a half years later on children's performance of spelling, reading comprehension and linguistic knowledge. The findings were that maternal literate mediation and print mediation in kindergarten significantly predicted spelling and reading comprehension two and a half years later even with SES and kindergarten measures of linguistic knowledge and word writing statistically controlled. These studies highlighted the significance of early maternal mediation of writing, indicating that a high quality of parental mediation not only teaches the child specific contents of writing, but that it also supports the child's growth into an efficient learner. In addition, it is also possible

that maternal mediation increases the child's intrinsic motivation to delve deeper into problems and prompts children's learning of metecognitive strategies to facilitate independent learning (Feuerstein, 1998).

The self-developed scales of literate mediation and print mediation in Hebrew (Aram & Levin, 2001; 2004) capture two different aspects of the mother-child writing interaction. Basically, the literate mediation scale captures mothers' specific encoding and decoding components of the word-writing process. For example, when a mother is helping her child in writing *r* from the word *carrot*, she says something like the following: "/R/ is the same sound as you hear in the beginning of *rat*; R makes the /r/ sound." They ordered the scale from lower to higher levels as mothers' mediation emerged from a more surface level (e.g., dictating individual letters for children to write) to a deeper level (i.e., facilitating children's efforts to retrieve phonemes and then represent these as letters). In contrast, the print mediation scale reflects the degree of autonomy that mothers allow their children in retrieving letter shapes and in producing letters. The scale includes three categories, from mothers facilitating the child's copying of letters, to mothers scaffolding this process, to mothers monitoring and encouraging independent writing with the levels ranging from lower to higher.

To my knowledge, these studies pioneered the investigation of relations between parent-child writing interaction and literacy development. Their quantitative methodology in capturing the dyad interactions (e.g., Aram & Levin, 2001) is particularly attractive in understanding the complex scaffolding processes in early literacy interactions. At the same time, there is much room for research to go further

on this topic. First, these scales of literate mediation and print mediation (Aram & Levin, 2001; 2004) may not adequately reflect various aspects of parent-child writing interaction features. Those scales focused primarily on cognitive and autonomy-granting aspects of maternal mediation. However, how social emotional aspects of parent-child interactions relate to literacy development have not been analyzed and remain unclear and in need of further exploration. Parents have been found to function not only as instructors in these situations by clarifying, extending, and explaining children's writing initiatives and providing extra knowledge, material and information, but also function as judges by supporting, valuing, criticizing, and responding to children's writing activities (e.g., Burns, Johnson, Ogan, & Vye, 1990; Kamins & Dweck, 1999; Laosa, 1980; Mueller & Dweck, 1998; Ng, Pomerantz, & Lam, 2007). Thus, it might be more informative to include a measure of social emotional interactions as well for these writing tasks.

In addition, the relation between maternal writing mediation and children's literacy-related skills may need to be more widely explored and tested. For example, morphological awareness, which has been established as important in early literacy development (e.g., McBride-Chang et al., 2003), was not included in previous studies. It would also be interesting to see these ideas of maternal writing mediation tested cross-culturally, especially in cultures whose scripts were not alphabetic, e.g., the logographic script of Chinese. In this way, we may be able to gain a relatively wide perspective on this issue, and interesting similarities and differences might emerge from these contrasts. Unfortunately, no such study has been done in Chinese so far.

Therefore, in the present research, I first aimed to examine maternal mediation in writing Chinese words. I developed two scales of maternal mediation as adaptive specifically to Chinese, one examining the cognitive aspects of this mediation and the other the autonomy aspect. Both were based on the basic ideas from Aram and Levin (2001; 2004). These were tested across three age groups in Hong Kong. In a second study literate mediation and print mediation were compared across two Chinese societies of Hong Kong and Beijing. I also rated and compared social-emotional interactions, though these were not developed into a single scale per se. A Pinyin mediation scale was additionally developed in Beijing only in the third study of the present research. Moreover, I included a variety of cognitive/metalinguistic and literacy measures along with these mediation aspects to test relations among maternal mediation of writing, cognitive/metalinguistic skills, and literacy acquisition in two Chinese samples, from Hong Kong and Beijing, respectively.

Maternal mediation of writing in Chinese

My literate mediation, print mediation, and commentary mediation measures were developed following Neitzel and Stright (2003), in parallel with their three aspects of parent-child interaction, i.e., cognitive support, autonomy support, and social emotional support. The cognitive support and autonomy support scales were based heavily on work by Aram and Levin (2001; 2004), who developed the literate mediation and print mediation scales, respectively, to reflect these two.

Literate mediation captures the cognitive strategies mothers use to help their children in the encoding and decoding process. For example, in writing Hebrew words

with their children, mothers segment the word into sounds, connect segmented sounds to their respective letters, retrieve each given letter's shape, and print it (Aram & Levin, 2001; 2004). In contrast, print mediation measures the autonomy a mother grants her child in producing words. There is evidence that autonomy in parent-child interaction is important to early literacy development. The theory of literacy development proposed by Morrow and Smith (1990) states that children's active engagement in print related activities, as well as their exploration of oral and written language, contributes significantly to their literacy development. Children develop awareness of writing conventions as they discover that these conventions are useful for authentic communication. Their awareness of these conventions develops simultaneously with their understanding of how meaning is conveyed through written language. Commentary mediation assesses mothers' verbal responses and feedback on children's writing behaviors. Different types of comments have been found to be associated with differences in children's developmental outcomes (e.g., Kamins and Dweck, 1999; Ng, Pomerantz, & Lam, 2007). Below we discuss these three kinds of mediation more specifically and how and when they are applied to Chinese parent-child writing interactions.

Literate mediation

Maternal character writing mediation

In developing the literate mediation scale, I considered various strategies mothers might use in teaching their children, from basic rote memory and stroke instruction to more advanced semantic radical or phonetic radical explanation, to across-word level

inference or comparison. Rote memory may be prevalent among mothers given the traditional drill-and-practice philosophy of learning Chinese (e.g., Wu, Li, & Anderson, 1999). Tan, et al. (2005) demonstrated that practice in copying was helpful for children's reading development among 7-10 year-old Chinese children through facilitation of orthographic awareness and motor memory, which can promote long-term character learning. From about 3 years old, Chinese children can distinguish Chinese writing from drawing, and their emergent writing is composed of more strokes and dots, but not curves and circles (Chan & Louie, 1992), demonstrating that strokes and dots are relative simple and easy and children understand certain basic features of Chinese writing when they are very young.

Given the logographic features of Chinese characters, mothers may visualize the character or part of the character to facilitate children's learning. Some simple characters, which represent about 10% of present-day Chinese characters are especially easy to visualize. For example, 人(people) could be visualized as a person standing  , or 木 (tree) could be visualized as representing an actual tree  . Even some compound characters, i.e., those comprised of a semantic radical and a phonetic radical, could be analyzed using this visualization technique. For example, a mother may say that the right part of 孔 (hole) is like a hoe. Thus, mothers may use this visualization technique to help children understand and write Chinese characters.

Ho, Yau, & Au (2003) found that Hong Kong children appeared to demonstrate structure component knowledge of Chinese characters by age 5. Structure component knowledge refers to the specific locations of different components within Chinese

characters. For example, the character 花 (flower) is structured as a semantic radical at the top and phonetic radical at the bottom, whereas 瓶 (bottle) is structured as semantic radical at the right and a phonetic radical at the left. At a more advanced level, a mother may segment a Chinese character into different components in writing mediation. Approximately 80% of modern Chinese characters are compounds (Zhou, 1978), which consist of different components, typically a semantic radical and a phonetic radical. For example, 洋 (sea) consists of 氵 (water) and 羊 (goat); here, 氵 (water) is the semantic radical indicating the meaning 洋 (sea), and 羊 (goat) is the phonetic radical indicating the sound of 洋 (sea) pronounced as *yang2*. The number of semantic and phonetic radicals in Chinese is approximately 200 and 800, respectively (Hoosain, 1991). For a different example, 蜜 (honey) is comprised of ' ', 必, and 虫, but these are just different components, not necessary semantic or phonetic radicals. In scaffolding children's writing, to reduce children's memory load and make the character clearer, a mother may separate a character into smaller units, and she may also refer to those components' positions within a given character.

Different and what I interpret as slightly deeper in terms of analysis as compared to the above segmentation strategy as identified in Ho, Yau, & Au (2003) is that by first grade, Hong Kong Chinese children showed radical information knowledge. Radical information knowledge is defined as understanding of the functions of radicals within a Chinese character, i.e., the phonological cue of a phonetic radical and the meaning link of a semantic radical.

Particularly given the central focus of mothers on phonological cues as a way to

facilitate children's writing in alphabetic orthographies (e.g., Aram & Levin, 2001; 2004), I wondered if Chinese mothers would also explicitly draw children's attention to phonological cues, in this case of phonetic radicals. I considered two different ways in which such cues might be made, i.e., derivation and analogy. One example of derivation is that, in writing 清(clear), a mother may explain that its right side 青 (green) is the same as one's given name 青(green), and both have the same pronunciation *qing1*. A different example of analogy is that a mother points out that 晴(clear sky) and 清(clear) have close pronunciations; the reason for this is that they share the same radical phonetic radical 青(green). However, because phonetic radicals are relatively unreliable in expressing sound information (e.g., Cheung & Ng, 2003), I was not sure how much mothers would make use of this strategy. Moreover, given that Beijing children routinely learn Pinyin early on (and their mothers also know this system) which may implicitly or explicitly make them more aware of the sound of Chinese words, whereas Hong Kong Chinese children do not typically learn a phonological coding system to aid in reading Chinese (e.g., Cheung & Ng, 2003), I also wondered whether a focus on phonetic (i.e., sound) information would differ among mothers across these two cultures.

In addition to the above strategies, I considered the extent to which mothers might also focus on meaning-related mediation. I would term this strategy as morpheme mediation because I think there are three conceptually different categories within this level. Initially, it was not clear to me whether these should be grouped together under one broad strategy or distinguished, however. In one meaning-related

type of mediation, mothers mediate at a within-character level by explaining the form and function of the semantic radicals, similar to maternal mediation of phonetic radicals described above. For instance, in writing the character 蜂 (bee), a mother may explain that 虫 (insect) on the left side indicates that 蜂(bee) is a kind of insect. The second category focuses on shared morpheme across words, i.e., referencing the target character that has been seen in other words. For example, in writing 雀 from the word 孔雀 (peacock), a mother may explain that it is the same as the 雀 in the word 麻雀 (sparrow). Given the rich lexical compounding of Chinese, explicitly pointing out shared morphemes across words might be helpful in facilitating both reading and writing (e.g., McBride-Chang et al., 2003). The third category captures mothers' attempts to compare different characters with common features across words. One striking characteristic of Chinese words is their large number of homophones. As recorded, there are approximately 1700 tonal syllables corresponding to about 4500 of the most frequently used Chinese characters (e.g., Qian, Lee, & Soong, 2004). Though homophones are pronounced similarly, they differ in meaning and shapes. For example, 孔 in 孔雀 (*peacock*) and 恐 in 恐龍 (*dinosaur*) are both pronounced as *hung2*, but they have different meanings (*hole* and *afraid*, respectively) and are written differently. An analogy in English might be that the words *no* and *know* have different appearances and meanings but the same sound. Thus, mothers may compare them and point out their similarities and differences.

Maternal Pinyin writing mediation

I was further interested in developing a maternal mediation to relate to Pinyin

writing among Beijing children. Usually, Pinyin is formally introduced in the first semester of primary school first grade in Beijing. Thus, K3 children may have some, though limited, Pinyin knowledge given that most early children's readings in Mainland China contain Chinese characters that are also accompanied with Chinese Pinyin beside them. Thus, testing for maternal mediation in K3 children should be appropriate developmentally, because P1 children would have already mastered Pinyin knowledge and would, therefore, have no further need for mothers' help.

Pinyin is sound-transparent to some degree. It is like an alphabetic reading system to some extent, and is composed of onset, rime and tone conventionally (Siok & Fletcher, 2001). Mothers mediating Pinyin writing may directly retrieve the whole Pinyin syllable, or, alternatively, segment Pinyin into onset, rime, and tone to facilitate Pinyin writing. Some researchers (e.g., Leong, 1997) have stated that in conventional Pinyin instruction, onset and rime are taught as two independent parts. This is particularly true in teaching Pinyin reading. However, in practice,it is a necessary for children to write down each letter or each phoneme composing the syllable one by one; thus it is beneficial if children understand each letter or each phoneme independently. For example, in writing *hua1* in which *h* is the onset and *ua* is the rime, it is necessary to write down the Pinyin letters one by one, i.e., as *h, u, a*. Usually onset is composed of one single phoneme, but rime is more complicated and could be one or more than one phoneme, along with a given lexical tone.

In developing a Pinyin literate mediation scale, along with the conventional rules, I divided Pinyin into onset, rime and tone categories and extended this by one more

category to explore how mothers integrate these three parts into a whole. With a principle similar to those for the other literate mediation and print mediation scales, I developed the Pinyin mediation scale to progress from more unanalyzed and holistic to more analytic and specific with lower to higher mediation levels, following Aram and Levin (2001; 2004). To be specific, I viewed Pinyin mediation at the whole Pinyin (syllable) level as most unanalytic and holistic. In the middle level of analysis were mothers who mentioned or divided syllables into onset, rime and tone levels. Finally, facilitation of writing at the phoneme level was the most analytic and specific mediation level in my proposed scale. A study of Shu, Peng, and McBride-Chang (2008) on 3-6-year-old Chinese children found that Beijing K3 children were 89% correct on syllable deletion, but only 53% to 63% correctly on onset, rime, and tone deletion tasks, suggesting that syllable awareness develops earlier in children, while onset, rime, or tone level sensitivity is more complicated and difficult. Research in alphabetic scripts (Aram & Levin, 2001; 2004) has demonstrated that the more specifically a mother retrieves a phoneme for her child, the better the child's independent literacy. I, therefore, expected that a more specific focus would represent a deeper level of mediation in mothers and should, therefore, receive a higher score on Pinyin literate mediation.

Print mediation

As discussed above, given that literate mediation focuses on the encoding/decoding process of specific word writing, it was expected to differ strongly for the Chinese script(s) (i.e., traditional in Hong Kong; simplified in Beijing), as

compared to alphabetic scripts, as captured by Aram and Levin (2001, 2004). In contrast, the scale of print mediation was expected to remain largely similar across Chinese and alphabetic scripts, given that it reflects mothers' holistic granting of autonomy in retrieving character shapes and in printing words. Thus, as noted by Aram and Levin (2001), the Chinese print mediation scale was hypothesized to build across levels as follows: In level one, the mother would physically hold the child's hand and write; in level two, the mother would provide a model of the word and ensure that her child copied it. The mother would help the child only when the child encountered difficulties (i.e., scaffolding) in level 3, but this scaffolding might still involve the mother's own writing at this level. In contrast, at level four, the mother would merely monitor and encourage the child to write on his/her own. I was particularly interested in the extent to which mothers made use of each strategy and how each strategy was related to the child's literacy development. Part of this dissertation was focusing on replicating these basic levels taken from Aram and Levin (2001; 2004) in Chinese families.

Commentary mediation

Previous research examining adults' responses to children's motivation, copying strategies, and performance in given academic tasks has identified parents' different types of responses. Responses can vary, for example, on positive vs. negative attitudes, as well as whether the comment is oriented toward the process, outcome, or person; these different responses may have different relations with children's developmental outcomes (e.g., Kamins & Dweck, 1999; Mueller & Dweck, 1998). Kamins and

Dweck (1999) particularly distinguished adults' responses to 5- to 6-year-old children into three areas in role-play tasks, i.e., process-, outcome-, and person- centered. Process comments are those for which adults' responses are directed to children's strategies and effort. For example, a mother points out particular mistakes and suggests a way to deal with them. Outcome comments focus on broad overall performance. An example Kamins and Dweck (1999) coded within the process category was "That's not what I call doing it the right way. " Person comments are responses that focus directly on personal traits, abilities, or intelligence. For example, "you are smart" or "Don't be so stupid."

Previous research on negative responses has largely and consistently demonstrated that these tend to undermine individuals' self-esteem and self-efficacy, thus dampening children's performance. However, some studies (e.g., Ng, Pomerantz, & Lam, 2007) have demonstrated some exceptions to such findings, especially in Chinese children. Ng, Pomerantz, and Lam (2007) showed that Chinese parents tend to emphasize failure and de-emphasize success in their 5th grade children. In addition, they experimentally manipulated children's success and failure in a laboratory setting in puzzle tasks, and parents' positive and negative responses subsequently were recorded. Results showed that Chinese parents' negative statements could even predict improvement in children's performance, possibly because they pointed out where children needed to improve and motivated children to do so. Past research on the effects of positive responses has found more controversial results. Some studies have recorded benefits of ability praise (e.g., Schunk, 1994, 1996), effort praise (e.g.,

Butler, 1987, 1988), and positive affect (Pomerantz, Wang, & Ng, 2005), basically because positive responses may make children feel they have the capacity to succeed, and, thus, motivate them to learn (Briggs, 1970). As Mueller and Dweck (1996) reported, 85% of American parents polled believed that praising children's ability is necessary to keep children feeling that they are smart. However, some others have demonstrated the opposite results(e.g., Mueller & Dweck, 1998). Mueller and Dweck (1998) examined the different effects of parents' praise for intelligence and praise for effort in fifth graders, and found that praise for intelligence had more negative consequences, including less task persistence, less task enjoyment, and more low ability attributions for children's achievement motivation, as compared to praise for effort, basically because children who were praised for intelligence then viewed it as a more fixed trait as compared to children praised for hard work.

On a different dimension of process-outcome-person, Kamins and Dweck (1999) examined the effect of process, outcome, and person responses in both a failure task with these types of criticism and a successful task with these types of praise, and the results showed that children tended to have the highest self-assessments, affect, and persistence after process responses, regardless of whether or not these comments were positive or negative. In contrast, person responses tend to be associated with children's lowest self-assessments, affect, and persistence. The researchers described children as displaying more "helpless" behaviors, including self-blame after either person criticism or praise than after process criticism or praise. These results are in line with results from Mueller and Dweck (1998) showing that a focus on children's

abilities, even when positive, could undermine children's motivation and performance.

Previous studies described above on parental responses were almost all examined in a context of problem solving tasks or children's report on questionnaires. In this research I examined different types of responses in the context of mother-child interaction in writing Chinese characters. Because the word writing context may require more detailed steps and precision, at least as compared to a general goal for solving a problem, the results of maternal responses to children's performances could theoretically be different from the results previously found in problem-solving tasks. I analyzed commentary mediation in the same two dimensions and five categories, i.e., positive, negative, process, outcome, and person. I expected that Chinese mothers might respond relatively negatively overall given previous work on Chinese parents in this domain (e.g., Ng, Pomerantz, & Lam, 2007). In addition, process comments were hypothesized to be most strongly positively associated with children's literacy achievement skills because the focus on effort and strategies, pointing out children's mistakes, and suggesting detailed corrections may be particularly important in this word writing task.

Hypotheses of the present studies

In the present studies, my main purposes were to investigate the nature of maternal mediation of Chinese word writing in the aspects of literate mediation, print mediation, and commentary mediation, and their relations to cognitive/metalinguistic skills and literacy acquisition. These explorations spanned the cultures of Beijing and

Hong Kong. In study 1, I developed and tested the maternal (literate and print) mediation scales in a Hong Kong kindergarten (K2, K3) and first grade sample, given the fact that Hong Kong Chinese families begin formal literacy training earliest across Chinese societies (e.g., Cheung & Ng, 2003). In Study 2, this scale was replicated and refined both in Hong Kong and in Beijing kindergartners (K3), as well as in first graders in Beijing. First graders in Beijing were included on the assumption that their literacy skills were likely to be better matched to the Hong Kong K3 sample given that the Hong Kong children had begun literacy instruction earlier than did the Beijing children. In addition, in Study 3, I developed a maternal mediation scale for Pinyin writing and examined its associations with various measures of literacy development in Beijing K3 children.

Parent-child collaborative reading and writing are prevalent in children's kindergarten years in both Hong Kong and Beijing. Li and Rao (2000), in a sample of 160 Hong Kong and 160 Beijing parents, documented that in both Hong Kong and Beijing, about 70% of parents taught their 2-6-year-old children to read Chinese characters at home. In addition, over 50% Hong Kong parents reported teaching their children to write Chinese characters at home. Relatively fewer Beijing parents (about 34%) said that they had taught their children to write. Moreover, most parents in Beijing (62%) and Hong Kong (58%) said that they believed that preschool was the appropriate time to start teaching literacy skills.

Comparisons between the two Chinese societies of Hong Kong and Beijing are particularly interesting for a number of reasons. First, educational policy and

curriculum guidelines for pre-school children vary markedly in these two societies (Li & Rao, 2005). In Hong Kong, the pre-school curriculum guidelines provide suggestions on the teaching of both Chinese and English literacy (Hong Kong Education department, 1996). The Hong Kong government considers the early years a time to promote Chinese reading and writing (Wong & Rao, 2004). In stark contrast, in Beijing, the teaching of Chinese reading and writing is prohibited, and the government officially advocates play-oriented learning for pre-school children; indeed, they denounce the explicit teaching of academic skills (China Preschool Education Research Society, 1999). Second, spoken language usage differs substantially across Hong Kong and Beijing. Beijing is a monolingual society with the official language being Mandarin. However, Hong Kong is a bilingual (Cantonese and English) or tri-lingual (Cantonese, English, and Mandarin) society, with the mother tongue as Cantonese. Third, the written script is different in these two societies. In Hong Kong people use traditional script, whereas in Beijing people read and write the simplified script.

All of these, especially government policy and written script, could potentially have an important influence on mothers' use of literacy instruction strategies in young Chinese children. Maternal mediation is possibly influenced by government educational guidelines. For example, following the pre-school curriculum policy, Hong Kong mothers may actively teach children Chinese characters with detailed instruction and feedback, such as segmenting characters into various components and with detailed explanations. However, Beijing mothers may teach Chinese character

writing in a more broad way, for example by using character-level application or comparison. In addition, the different written scripts may influence maternal mediation as well. Compared to simplified script, traditional script contains richer strokes and components and may be easier to be visualized. Thus, Hong Kong mothers may be more likely to use stroke, visualization, or component strategies as compared to Beijing mothers.

Within this important cross-cultural context, I was interested in kindergarten and first grade children for the following reasons: First, children in these ages are those who know something about Chinese writing (e.g., linearity, or some simple characters, such as 山), but do not fully understand the form and function of Chinese characters. Research has suggested that through approximately the age of 9 years, Chinese children gradually develop a systematic use of phonological/semantic components (e.g., Chan & Wang, 2003; Ho, Yau, & Au, 2003). Second, previous studies of maternal mediation of writing have mainly focused on children of ages 5-6 years old (Aram & Levin, 2001; DeBaryshe, Buell, & Binder, 1996; Korat & Levin, 2001). Thus, this age group was appropriate in the present study so as to provide an earlier comparison with previous work on alphabetic scripts. Third, in Mainland China Pinyin is taught usually at the first semester of grade 1. Although there is only one year difference between K3 and P1 children, differences in literacy ability were expected to be large for this group because of the introduction to formal literacy skills in first grade.

In measuring children's literacy skills, I included both Chinese word reading and

writing tests. In addition, orthographic awareness was examined in relation to how it was associated with maternal mediation. This was important, given the focus on knowledge of specific locations and functions of radicals of Chinese characters in orthographic knowledge measures. I also measured children's morphological awareness using the tasks of morphological construction tapping children's ability in morpheme-level understanding and application, and ortho-semantic awareness, tapping children's understanding of semantic radical form and function. Moreover, phonological awareness, which was found to be a strong correlate of maternal mediation in alphabetic scripts, was tested in the measures of syllable deletion and phoneme deletion to examine whether it was related to maternal mediation in Chinese writing. Furthermore, children's visual skills, nonverbal reasoning ability, and maternal mediation information were also collected as control variables in the present studies.

Apart from the hypothesized association between metalinguistic awareness and maternal mediation of writing, previous studies have also demonstrated strong relations between metalinguistic skills and literacy development in Chinese children. Orthographic awareness (e.g., Li, Peng, & Shu, 2006; Shu & Anderson, 1998), morphological awareness (e.g., McBride-Chang, Shu, Zhou, Wat, & Wagner, 2003), and phonological awareness (e.g., Ho & Bryant, 1997a; McBride-Chang & Ho, 2000; Siok & Fletcher, 2001) have frequently been found to be important for Chinese children's literacy development. Below I elaborate my hypotheses and predictions.

The nature of maternal mediation across culture and age

By comparing across Hong Kong K3 and Beijing K3 children, we can roughly consider cultural differences and similarities in maternal mediation in three aspects of mother-child interactions, i.e., literate mediation, print mediation and commentary mediation. In examining age differences, I compared Beijing K3 and Hong Kong K3 groups in all literate mediation scale, print mediation scale and commentary mediation aspects.

In terms of cultural comparisons in kindergarteners, I expected that Hong Kong kindergarters' mothers would mediate word writing at a higher level for the literate mediation and print mediation scales, as compared to mothers of Beijing kindergarteners. I reasoned that Hong Kong children's independent literacy skills tend to be higher than those of Beijing children. Reading and writing instruction for kindergarten children is encouraged by the Hong Kong government (Hong Kong Education Department, 1996). Typically, in Hong Kong kindergartens, children begin formal training in Chinese reading and writing around 3.5 years old when they are in the first year of kindergarten. In the second year of kindergarten, they begin to learn multiple-character words and some phrases. By the end of third year kindergarten, children are expected to have learned 150-200 characters and simple sentences. However, in Beijing, teaching of reading and writing Chinese in preschools has been prohibited since 1956. Although literacy instruction has been surreptitiously undertaken in Beijing at the frequent request of parents in some private literacy institutions (Li & Rao, 2000; Liang, Li, & Wu, 1997), kindergarten children's literacy skills are relatively limited, especially for Chinese writing. With literacy levels among

Hong Kong children higher than those of Beijing children on the one hand, and mothers' sensitivity to children's "zone of proximal development" as found in previous studies (e.g., Aram, 2007) on the other hand, it seemed likely that mothers would mediate at a higher level for Hong Kong kindergartners than for Beijing kindergartners. I expected the same results for both literate mediation and print mediation because they are both closely related to children's independent literacy skills (Aram & Levin, 2001, 2004).

Particularly for literate mediation, I further expected that mothers might mediate more frequently on strokes and components because of the difference in scripts across cultures, with traditional script used in Hong Kong and simplified script used in Beijing. As traditional script usually contains more strokes and components than simplified script, in daily reading and writing activities, Hong Kong mothers may have more opportunities and cues to inspire children's writing than will Beijing mothers. Chen and Yuen (1991) found that children from Hong Kong and Taiwan did much better in orthographic awareness than children from the Mainland, for example. Thus, it is possible that maternal mediation in Hong Kong focuses on such components.

For commentary mediation, a study by Berndt, Cheung, Lau, Hau, and Lew (1993) examined parenting in Chinese families across Chinese societies, and found that Hong Kong adults perceived parents as less warmth than did Taiwan and Mainland China adults. In addition, maybe because of the "one-child" policy in Mainland China, the child is usually the center of a family (Liu, 2006). Thus, I hypothesized that mothers

in Beijing might express more positive comments than those in Hong Kong. However, for the other dimensions, i.e., of process, outcome, and person, given the relatively sparse literature documenting Chinese parents' response types, I did not hypothesize differences across locations in mothers' mediation styles.

The validation of the proposed scales of literate mediation and print mediation were first examined in Study 1 with a sample of Hong Kong children, and after that, Study 2 compared the nature of maternal mediation of writing across Hong Kong and Beijing and across different ages of K3 and P1 children.

For age comparison across the two Beijing grade levels, higher maternal mediation levels in literate mediation and print mediation were expected in Beijing P1 children than in Beijing K3 children. Obviously literacy skills in P1 children were expected be higher than for K3 children because of the one-year formal and intensive reading and writing training. A study by Pellegrini, Brody and Sigel (1985) found that parents were generally more directive and made fewer cognitive demands of younger and communication-handicapped children than for older and typically developing children. Because of the lower literacy level of kindergarten children, e.g., their abilities to write only simple strokes, mothers were expected to demonstrate lower levels of mediation to them. For example, hand-holding, stroke-instruction, and asking their children to copy text directly were anticipated. However, given that first graders already know simple characters, which can often serve as semantic or phonetic radicals for other compound characters (e.g., 虫 (insect), 火 (fire)), mothers were expected to demonstrate higher level mediation for these children. For

example, I expected to see them do more in terms of segmenting components, explanation of phonetic and semantic radicals, or across-word comparisons. To summarize, for literate mediation and print mediation, I expect a higher level mediation score of P1 children than kindergarten children.

For commentary mediation, I expected fewer comments overall for P1 children as compared to kindergarten children basically because P1 children are less likely to make mistakes than are K3 children given their better prior literacy knowledge.

Overall, then, I expected that mediation scores of literate mediation and print mediation would be higher for Hong Kong children than for Beijing children and higher for older children than for younger children. Beijing mothers were hypothesized to make more positive comments than Hong Kong mothers, and kindergarten mothers were expected to comment more frequently than would first grader mothers.

Relations of maternal mediation to cognitive/metalinguistic awareness and literacy skills across cultures and ages

I further expected that the literate mediation scales would relate fairly strongly to literacy skills and metalinguistic awareness in both Hong Kong and Beijing. Print mediation and commentary mediation were also expected to be associated with children's literacy skills across Hong Kong and Beijing. In addition, I hypothesized that maternal Pinyin mediation might be strongly associated with literacy development in Beijing K3 children. Given that literate mediation focuses on specific decoding and encoding process and is probably able to reflect interesting comparisons

across Hong Kong and Beijing, and even to contrast with alphabetic scripts, I elaborate my specific hypotheses about literate mediation to metalinguistic awareness and literacy skills below.

Orthographic awareness

I hypothesized that competent literate mediation in Chinese would be associated with stronger orthographic awareness. Orthographic awareness, applied to Chinese characters, refers to the knowledge of specific locations and functions of phonetic and semantic radical in Chinese characters. During mother-child collaborative writing, mothers may deconstruct characters into a unique pattern of strokes and components and then regroup these subcharacters into a square linguistic unit. This type of decoding occurs at the visual-orthographic level and is assumed to facilitate children's awareness of the character's internal structure----orthographical awareness. Tan et al. (2005) demonstrated that writing practice of Chinese children aged 7-10 years significantly improved their reading ability through orthographic awareness. Numerous studies have also shown that reading experience and print exposure account for a significant proportion of variance in orthographic skills (e.g., Juel, Griffith, & Gough, 1986).

Given the differences in traditional vs. simplified script in Hong Kong and Beijing, the role of literate mediation in orthographic awareness might be expected to be different across societies.Because traditional Chinese is richer in strokes and components than is simplified Chinese, a character segmentation strategy in literate mediation might be more important in learning traditional script than in learning

simplified script. Chen and Yuen (1991) examined children's learning of Chinese characters in Mainland China, Taiwan, and Hong Kong and showed that children from Hong Kong and Taiwan did much better in orthographic awareness than did children from the Mainland. Another study by Chan and Wang (2003) tested pseudoword selection among 5-9 years old children across Hong Kong and Beijing and found that 6-year-old Hong Kong children developed orthographic awareness better than did Beijing children. Thus I hypothesized that the association of literate mediation and orthographical awareness in Hong Kong would be stronger than the same association in Beijing.

Morphological awareness

I further hypothesized that literate mediation would be associated with morphological awareness in two ways. First, writing mediation fosters morphological awareness through understanding of semantic radicals. As discussed earlier, effective literate mediation clarifies and explains the nature of the semantic radical, and this may facilitate children's understanding of the character meaning – i.e., morphological awareness. For example, Wu, Anderson, Li, Chen, and Meng (2002) demonstrated that fourth grade students whose teachers explicitly linked semantic radicals to character meaning performed better in morphological awareness tasks. Second, literate mediation may improve morphological awareness through inter-character application and comparison. Writing mediation helps children to connect, clarify and distinguish various morphemic boundaries, such as homophones, reversed words, and same character in different words. Strong associations of literacy and morphological

awareness have been demonstrated in several studies (Ku, & Anderson, 2003; McBride-Chang, Shu, Zhou, Wat, and Wagner, 2003; McBride-Chang, et al., 2005). Given that one morpheme corresponds to one syllable and one character similarly in Hong Kong and Beijing, it was expected that the effect of literate mediation on morphological awareness would be the same across Hong Kong and Beijing.

Phonological awareness

I did not hypothesize a strong association between literate mediation and phonological awareness, especially in Hong Kong. Though strong relations of literate mediation and phonological awareness have been found in alphabetic scripts (Aram & Levin, 2001), things in Chinese are different. Chinese words are sound-opaque, especially in Hong Kong, where children learn words using the "look and say" method and no phonetic coding system is introduced. In Beijing, Pinyin is used to help with reading and writing. The study of Chen and Yuen (1991) revealed that children from Mainland China and Taiwan performed better than Hong Kong children in phonological awareness. Thus, I thought it might be the case that literate mediation would be positively associated with phonological awareness in Beijing, but probably not in Hong Kong.

Literacy skills

I hypothesized strong associations between literate mediation and reading and writing skills in both Hong Kong and Beijing. In the encoding/decoding process of maternal mediation of writing, mothers model, visualize, segment, and explain various components in a word. Those guidance and teaching strategies are all with the

aim to help children learn Chinese character writing. It may be that through literate mediation children directly build the writing patterns into long term motor memory as indicated by Tan et al. (2005). Given the decoding and encoding nature of maternal mediation, it is also possible that literate mediation improves literacy skills through the mediator of metalinguistic awareness, especially orthographic awareness and morphological awareness.

Writing of Chinese words requires a high-order organization of strokes and components that constitute the internal structure of the character or word. Through the mediation of writing, children are first taught to decompose the character into strokes and components, during the process of which metalinguistic awareness, especially orthographical awareness and morphological awareness are gradually enhanced. This awareness thus further supports the connections among orthographic and semantic units of the Chinese writing system and improves children's independent reading and writing (Li, Peng, & Shu, 2006; Shu & Anderson, 1997). Whether orthographic awareness or morphological awareness would function as a mediator in the relation between literate mediation and literacy skills, and whether either would be a full mediator or partial mediator of these were other questions I tested in this research.

To summarize, my first goal, focused on Study 1, was to modify and validate the maternal mediation scales from Aram and Levin (2001), an extension and adaptation of these original scales to the Chinese script. This was done over a wide age range of second and third year kindergartners (K2, K3) and first graders (P1) in Hong Kong, where writing begins very early, even among Chinese societies (Cheung & Ng, 2003).

Second, in Study 2, I analyzed the nature of mother-child writing interactions in three groups of Hong Kong K3, Beijing K3 and Beijing P1 children by using these adapted/developed scales, of literate mediation and print mediation. These scales in Study 2 were further modified from those of Study 1 for maximum utility. A third goal was to examine the relation of literate mediation to metalinguistic awareness skills and literacy skills in three groups. Additionally (fourth), I tested the relations of print mediation to metalinguistic awareness, and literacy skills in three groups. A fifth goal of Study 2 was to investigate the relation of commentary mediation, developed and extended in this study only, to literacy skills in three groups. Where possible, I used the results of these scales to compare across Hong Kong and Beijing children to look for similarities and differences in mediation techniques. Sixth and finally, I developed scales to examine the role of maternal Pinyin mediation for Chinese character reading and writing among Beijing K3 children.

Chapter Two Study 1

Study 1 aimed to address the first issue, i.e., that of modifying and validating both the literate mediation and print mediation scales developed by Aram and Levin (2001) for Hebrew in order to be suitable for Chinese script. To be specific, I tried to address three aspects of maternal mediation of young Chinese children's writing by developing these scales. First, I aimed to date and categorize different strategies that appeared in the maternal mediation of writing. Although, through a review of previous research and my own observations in daily life, I knew that mothers might use rote memorization, visualization, component segmentation strategies and so on for literate mediation, and hand holding, copying, and monitoring for print mediation, I wanted to document the prevalence of each strategy mothers use in coaching their children in writing. In addition, it was important to explore the developmental trajectory of mothers' use of each strategy according to children's educational levels. I included in the present study three groups of Hong Kong Chinese children of second year kindergarten, third year kindergarten, and primary school first graders and their mothers. These different educational levels could maximize the variability of children's literacy skills and mothers' mediation strategies, particularly in Hong Kong, where formal literacy instruction begins very early (e.g., Cheung & Ng, 2003; Li & Rao, 2000). I also endeavored to establish the ordinal scales of both literate mediation and print mediation according to the associations of each strategy with literacy attainment. Our measure of literacy attainment was a Chinese word reading measure only, because previous studies (e.g., Aram & Levin, 2004) showed that children's

reading performance was among the strongest correlates of maternal writing mediation. Moreover, because recognition (i.e., word recognition) typically develops earlier than production (i.e., writing), a measure of reading may be more reliable than is the assessment of writing for gauging children's literacy skills, at least for those children ages 3 to 6 year old in the present study (e.g., Clay, 1998; Levin, Share, & Shatil, 1996). These scales were developed in Study 1 with a view to using them to understanding different aspects of literacy development, e.g., their associations with various metalinguistic abilities and comparisons across cultures, in Study 2.

Method

Participants

Participants were 67 mothers and their children, including 23 K2-mother pairs with 15 boys and 8 girls (mean age = 5.06 years, SD = 0.45), 20 K3-mother pairs with 10 boys and 10 girls (mean age = 5.97 years, SD = 0.45), and 24 primary school P1-mother pairs with 11 boys and 13 girls (mean age = 6.89 years, SD = 0.58). All participants were native Cantonese speakers recruited voluntarily from three kindergartens and two primary schools, and most of them were from backgrounds that were of middle socioeconomic status.

Reading and writing instruction for kindergarten children is encouraged by the Hong Kong government (Hong Kong Education Department, 1996). Hong Kong Chinese teachers mainly use the "look and say" method in teaching Chinese characters (e.g., Cheung & Ng, 2003), and there is no phonetic coding system introduced in Hong Kong to learn Chinese in the mother tongue. Typically, in Hong

Kong kindergartens, children begin formal training in Chinese reading and writing around 3.5 years old when they are in the first year of kindergarten. In the second year of kindergarten, they begin to learn multiple-character words and some phrases. By the end of third year kindergarten, children are expected to have learned 150-200 characters and simple sentences.

Measures

Maternal mediation of Chinese character writing

In the mother-child writing interaction, each mother was asked to help her child to write all twenty-two two-character words as best she could, and these mother-child interactions were videotaped. All words were depicted in pictures and no print form was shown to the mother or the child. This was done to ensure that neither mothers nor children made use of given print. Rather, they had to work together to produce the writing themselves. To make sure the dyad was writing those words I intended them to write, mothers were initially orally introduced to the words on picture cards. The dyad was further instructed to write on one paper sheet for one word; they wrote on the same paper sheet with the mother using a red pen and the child using a blue pen.

These twenty-two two-character words fell into seven categories as shown in Appendix 1. These include

homophones (孔雀 *hung2zoek3*—恐龙 *hung2lung4*, (peacock—dinosaur)), reverse-ordered characters (蜜蜂 *mat6fung1*—蜂蜜 *fung1mat6*, (bee—honey)), one matched characters (信封 *seon3fung1*—信纸 *seon3zi2*, (envelope—letter pad)),

similar phonetic components and different semantic components (晴天 *cing4tin1*—眼睛 *ngaan5zing1*, (sunshine—eye)), similar pronunciation (汽車 *hei3ce1*—起床 *hei2cong4* (car—to get up)), visually similar characters (太空 *taai3hung1*—大人 *daai6jan4*, (space– -adult)) and homographs (行李 *hang4lei5*—銀行 *ngan4hong4* (luggage--bank)). I selected those words and categories with the purposes of first trying to reflect the characteristics of Chinese characters by including both simple character and compound characters with the latter category being more prevalent than the former one. Second, I included words with similarities and differences across seven categories with the intention to maximize opportunities for mothers to adopt different strategies for writing facilitation. All words were intended to be ones that children should have known orally but should not have necessarily known from school instruction.

Joint literacy activities

To briefly record mother-child collaborative reading and writing activities at home, I asked mothers to write down the number of hours they weekly spent on reading and writing together with their children. Each reading and writing question was a single item only and followed by open-ended questions to collect more information on joint literacy activities if mothers were willing to share.

Mothers' Education level

Mothers' education level was assessed on a 7-point scale with the following categories: 1 = primary 3rd grade or below, 2 = primary 4th grade to 6th grade, 3 = middle school 1st to 5th grade, 4 = middle school 6th to 7th grade, 5 = high school, 6

= university, and 7 = postgraduate.

Chinese character recognition

Sixty-one 1- or 2-character words (e.g., McBride-Chang & Ho, 2000) were combined with 150 two-character words used in a character recognition task from the Hong Kong Test of Specific Learning Difficulties in Reading and Writing (Ho, Chan, Tsang, & Lee, 2002). These words were arranged with the difficulty level gradually increased. Children were asked to read from the beginning of the test. One point was given for correctly reading each word. The testing stopped when children failed to read 15 consecutive items. The maximum possible score on this task was 211, and its obtained internal consistency (Cronbach α) was .99.

Non-verbal reasoning

Sets A and B from Raven's Standard Progressive Matrices (RCPM; Raven, Court, & Raven, 1995) were used as an estimate of children's nonverbal reasoning ability. There were 24 items, and the total score was 24. The internal consistency reliability obtained in this study was (Cronbach's α) = .81.

Procedure

All the measures were administered individually at participants' homes. The maternal mediation for the character writing task was given first, and the whole mother-child interaction was videotaped; it typically lasted 40 minutes. After finishing the collaborative writing, the child was given time to rest and the mother was asked to fill in a brief demographics questionnaire. Following that, the child was finally asked to complete the character recognition and nonverbal reasoning measures.

Before conducting this study, I did a pilot test on eight mother-child dyads, and their interaction was recorded. I analyzed and organized mothers' decoding strategies into six independent categories, meaning that mothers could use all these strategies in mediating a particular character. According to the study of Ho et al. (2003) on spelling skills in Chinese and the findings by Chan and Louie (1992), I temporarily ordered these six strategies focusing on Chinese character decoding as follows (LM is the abbreviation of literate mediation) from a lower level to a higher level.

1. *Mother shows a model of the character to the child (LM1)*: In this category, a mother gave a model of the character and asked the child to write it. This model could be created by the mother herself, who wrote it for her child or who looked it up from a dictionary and showed the child that model. Different from the second strategy, in this strategy, the mother does not draw children's attention to specific strokes.

2. *Mother focuses on strokes within the character (LM2)*: This strategy captures the mother's specific attention to specific strokes within the character. For example, in writing 天 (sky), the mother said the second horizontal line should be longer than the first one.

3. *Mother employs visual cues to help the child to visualize the character (LM3)*: Imagination or linkages being made by a mother from a pictured object to a character or part of a character were the crux of this strategy. An example of whole character visualization would be that a mother points out the visual similarity between the character 山 (mountain) and the actual object, i.e., the mountain ( ). Another mother pointing out that the middle part of 中 is like a box would be an example of

the visualization part of a character. I ordered this as higher level than that of the stroke focus in LM2 because here, the mother tries to get the child to attend to the feature of (part of) the character, a more complex task than a focus on a single stroke.

4. *Mother segments characters into radicals (LM4)*: In this category, the mother points out the subcharacter components, including the semantic radical, phonetic radical, or other subcharacter components or their positions. For example, in writing 眼 (eye), a mother said to her child that its left side is 日 (sun). However, this level only captures the mother's pointing out of the radical or position, but it involves no mention of the radical function such as meaning or sound conveyed by the radical.

5. *Mother relates characters to phonetic information (LM5)*: This strategy captures mother's attempts to explain the phonetic radical of a character indicating the sound of the character, or its similarity in sound relative to other characters containing the same phonetic. For example, a mother said to her child that two similarly pronounced characters, 晴 (clear sky) and 眼 (eye), contained the same phonetic component. This focus on specific sound information typically is among the highest levels in scales of maternal mediation of alphabetic scripts (e.g., Aram & Levin, 2001).

6. *Mother relates characters to morphological knowledge (LM6)*: Different from all other strategies mentioned above, this strategy focuses on meaning related explanations, including the mother's pointing out of similarities and differences on the inter-character level comparisons and semantic radical functions, which means how the semantic radical relates to the word meaning. For example, a mother explained to her child that 车 (vehicle) from the word 汽车 (truck) was the same character 车

(vehicle) from the word 火車 (train) that the child just wrote.

Following Aram and Levin (2001)'s idea, I also extracted a print mediation scale during the mother-child writing interaction. It differs from the literate mediation scale in that it captured the writing autonomy of who did the writing and how the mother allowed the print to be produced. Given this broader focus, I expected print mediation in Chinese writing would largely follow the scale developed by Aram and Levin (2001; 2004).

Based on the eight pilot observations and previous studies of print mediation (Aram & Levin; 2001; 2004), four levels of print mediation were extracted and ordered as follows:

1. *Mother holds child's hand and writes (PM1):* At this level, the child was passive, and basically the mother controlled the whole writing order and pace.

2. *Mother writes and child copies the character (PM2):* This level allowed higher autonomy than the first one because the child himself/herself actively engaged in the writing process. Though the child still needed to follow the model, he/she could write according to his/her own pace.

3. *Mother scaffolds the child in writing the character (PM3):* At this level, the mother helped only when her child did not know how to proceed. For example, when a child did not know how to write a phonetic component of the character, then the mother wrote down that radical only for her child. Because in this level, it was demonstrated that the child had some prior knowledge, I assumed this level to be higher than the second one.

4. *Child writes the character on his/her own, usually encouraged by mother (PM4):* At this highest level, the whole character was written by the child himself/herself without any model from the mother, though they were usually encouraged and still monitored by the mother. During the writing process, the mother verbally or gesturally reminded the child of the Chinese characteristics or features. Thus, this level allowed the highest autonomy compared to the above three levels.

The analysis unit was uniformly the character level because mothers proceeded through the writing process character by character. This is different from alphabetic studies, such as Aram and Levin (2001), who analyze the data at the unit of the letter level.

Before computing the maternal mediation score, I first calculated the number of valid mediated characters for each mother. This was necessary because children's literacy levels varied greatly. For example, some children required their mothers' help on writing every character, whereas some other children could write some characters independently without mothers' mediation. Thus, I counted out those characters children could write independently because by definition maternal mediation was not involved in those characters. For this reason, I excluded 12.25%, 27.73%, and 44.79% of the whole 22 two-character word group for K2, K3 and P1 respectively.

Given that the number of excluded characters was different across different mothers, the number of valid mediated characters was accordingly different. Thus it may be more reasonable to use the percentage of each strategy mothers employed across all valid mediation characters to represent the maternal mediation score. The

computational formula was as below:

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

By using the above filter mechanism and above identified categories of both literate mediation and print mediation, all videotaped mother-child interactions were coded by a trained coder who was blind to study hypotheses. The same criteria were consistently applied in coding each character. Moreover, I had 21 (31.34%) cases that were double coded among all 67 videotapes by another trained coder who was unaware of the study purposes to estimate the inter-rater reliabilities. The obtained inter-rater reliabilities for literate mediation was kappa = .92, and for print mediation, it was kappa = .91) which suggested the coding was reliable.

In addition, to determine the typical mediation strategy, I simply selected mothers' most frequently used strategy. If there were two or more strategies that shared the same highest frequency, the one with the more advanced hypothesized mediation level was selected.

Results

The means, standard deviations, F-value and pair-wise comparisons are shown in Table 1. There were significant differences across grades in both Chinese word recognition and nonverbal reasoning tasks. P1 children were better in word recognition than K3 children, and the K3 children were better than the K2 children on this task. For nonverbal reasoning, P1 children also performed better than K3 and K2 children, but there was no difference between K3 and K2 children. In the measures of maternal education, and estimated amount of time spent on either joint reading or

joint writing by the mothers, there were no differences across different age groups, suggesting that the samples across three groups were comparable in maternal education and time spent on home literacy activities.

Table 1.

Estimated Mean Scores and Standard Deviations of All Variables of Three Groups of Participants (Second Year Kindergarten (K2), Third Year Kindergarten (K3), and First Grade of Primary School (P1)), and the F Values for Univariate Tests of Group Differences in Study 1.

Group/Task	K2 N= 23	K3 N 20	P1 N=24	F-value	Pairwise comparisons by LSD
	Mean (S.D.)	*Mean (S.D.)*	*Mean (S.D.)*	*F* (2, 64)	
Chinese word recognition (211)	46.17 (28.81)	73.70 (29.94)	120.00 (27.28)	39.97***	K2< K3< P1
Nonverbal reasoning (24)	11.91 (2.15)	13.50 (4.39)	17.88 (2.92)	21.51***	K2=K3< P1
Maternal education (7)	3.35 (1.15)	3.78 (1.47)	3.67 (1.27)	.66	
Joint reading hours	2.47 (2.20)	4.55 (3.72)	4.88 (4.64)	2.20	
Joint writing hours	2.21 (1.91)	2.71 (2.28)	2.95 (2.40)	.61	
Literate mediation variables					
LM1 (1)	.91 (.08)	.76 (.18)	.34 (.29)	48.02***	K2 >K3 >P1
LM2 (1)	.68 (.26)	.37 (.22)	.31 (.21)	17.22***	K2 >K3=P1
LM3 (1)	.15 (.16)	.03 (.06)	.06 (.10)	6.48***	K2 >K3 P1
LM4 (1)	.49 (.19)	.39 (.25)	.48 (.18)	1.67	
LM5 (1)	.00 (.00)	.00 (.01)	.00 (.01)	.52	
LM6 (1)	.33 (.19)	.27 (.18)	.54 (.15)	14.73***	K2 <K3< P1
LMtypical (6)	1.22 (.42)	1.80 (1.32)	4.25 (1.85)	33.52***	K2 K3< P1
Print mediation variables					
PM1 (1)	.25 (.37)	.07 (.19)	.01 (.03)	6.29***	K2 >K3=P1
PM2 (1)	.70 (.36)	.67 (.25)	.34 (.28)	9.86***	K2=K3 >P1
PM3 (1)	.09 (.09)	.07 (.07)	.13 (.13)	2	
PM4 (1)	.14 (.18)	.22 (.22)	.34 (.22)	6.02***	K2=K3< P1
PMtypical (4)	1.83 (.39)	2.15 (.67)	3.04 (.10)	17.09***	K2=K3< P1

Note: LM1=model, LM2=stroke, LM3=visualization, LM4=segmentation, LM5=phonetic function, LM6=morpheme, LMtypical= most frequently used level in literate mediation, PM1=hand holding, PM2=copy, PM3=scaffold, PM4=children write on own, PMtypical=most frequently used level in print mediation

*p < .05; **p < .01; ***p < .001

For literate mediation levels, model (LM1=.91) and stroke (LM2=.68) strategies were very prevalent for mothers' use with K2 children, and the model (LM1=.76) strategy remained highly used with K3 children. However, for P1 children, mothers shifted to the use of the morpheme (LM6=.54) strategy more frequently. The next relatively prevalent strategy was component segmentation (LM4=.39 to .49 across grade levels). It is interesting to note that mothers across all grades seldom used visualization (LM3) and phonetic function (LM5) strategies. If we look at the difference of each strategy use across grades, we see that mothers of K2 children used model, stroke, and visualization significantly more than mothers of K3 and P1 children. In contrast, for the morpheme strategy, P1 mothers showed a significantly higher frequency of use than K2 and K3 mothers. However, there was no difference on use of the segmentation or phonetic function strategy across grades. Perhaps because this is an obvious feature of Chinese characters, i.e., that they be segmented into components, and because Chinese characters are often taught this way in schools, at least for some grade levels, mothers of children in each grade all made relatively high use of this strategy. As an informal comparison with previous work with alphabetic orthographies (e.g., Aram & Levin, 2001), it is also interesting to note that use of phonetic, or sound information, was very rare, indeed almost nonexistent, among these Hong Kong Chinese mothers across grade levels.. The typical mediation strategy was relatively low on the scale for K2 (LMtypical=1.22) and K3 (LMtypical=1.80) children, but relatively high for P1 (LMtypical=4.25) children.

As for the print mediation categories, it was clear that the copy strategy was most

prevalent for K2 and K3 children, and the most prevalent strategies in P1 children were copy (PM2) and children writing on own (PM4). The results showed a developmental trend for three of the four strategies. Mothers of K2 children showed significantly more use of the hand holding strategy (PM1) than did mothers of K3 and P1 children. Moreover, copying (LM2) occurred more frequently in kindergartner-mother pairs as compared to first grader-mother pairs. In contrast, mothers of P1 children more frequently used the most advanced strategy of children writing on their own than did mothers of kindergarteners. The typical print mediation level showed that mothers of first graders allowed significantly higher autonomy than did mothers of kindergarteners.

Table 2 shows correlational results of literate mediation levels and word reading. Four of the six strategies were significantly correlated with Chinese word reading, with levels of model, stroke, and visualization negatively associated with character reading and level of morpheme positively associated with reading. Furthermore, the typical mediation level correlated highly with word reading at $r = .74$ ($p < .001$). These results suggested that our newly developed literate mediation scale with six strategies were in a reasonable order, with lower levels associated with low reading performance and higher levels with more advanced reading skills. The nonsignificant result of the phonetic function strategy with reading may be attributable to its very low frequency of usage, whereas the same result of segmentation might be due to mothers' similarly frequent use of it across grades.

The correlations of print mediation to character reading are shown in Table 3.

Lower levels of hand holding and copy strategies were significantly and negatively correlated with word reading, whereas higher levels of scaffolding and child independent writing were significantly and positively correlated with word reading. In addition, the typical print mediation level was also highly correlated with Chinese character reading ($r = .51$, $p < .001$). These results reflected a reasonable ordinal scale of our modified print mediation strategies.

Table 2.

Correlations among Chinese Word Recognition and Print Mediation Scores in Study 1.

Variables	1	2	3	4	5	6	7	8
1. LM1	--							
2. LM2	.18	--						
3. LM3	.06	.50***	--					
4. LM4	-.33***	.63***	.42***	--				
5. LM5	-.08	-.02	.00	.12	--			
6. LM6	-.56***	-.05	.23	.35***.	.12	--		
7. LMtypical	-.81***	-.29***	-.14	.14	.14	.64***	--	
8. Word recognition	-.72***	-.40***	-.30*	.14	.14	.55***	.74***	--

Note: N=67. *p< .05; **p < .01; ***p < .001

Table 3.

Correlations among Chinese Word Recognition and Print Mediation Scores in Study 1.

Variables	1	2	3	4	5	6
1. PM1	--					
2. PM2	-.31**	--				
3. PM3	-.13	-.35***	--			
4. PM4	-.13	-.66***	.20	--		
5. PMtypical	-.42***	-.44***	.28*	.64***	--	
6.Chinese word recognition	-.45***	-.42***	.34***	.45***	.51***	--

*Note: *p< .05; **p < .01; ***p < .001*

To further examine the extent to which the literate mediation scale and print mediation scale would account for the variance in children's Chinese word reading, I conducted hierarchical regression analyses. Because our relatively small sample called for conservatism in including variables in regression models, I did not include our crude measures of time spent in home reading and writing, particularly because they did not differ across grades. For the same reason, I only included the four strategies that were significantly correlated with word reading in explaining children's reading performance. As shown in Table 4, I statistically controlled children's age, grade, nonverbal reasoning, and maternal education in step 1; these collectively explained 59% variance of reading performance. The four literate mediation strategies were then entered in step 2. With the inclusion of these strategies, the total R^2 increased to 70%, a significant R^2 change, ΔF (4, 58) = 5.21, p<.01. Model and visualization strategies emerged as significant and negative predictors whereas the morpheme strategy predicted character reading significantly and positively in the final regression model. When I used the typical mediation strategy to explain character reading performance with the same variables controlled as shown in Table 4, it accounted for 8% of unique variance, ΔF (1, 61) = 14.74, p<.001, and typical mediation level was a significant and positive predictor among the final Beta weights, t = 3.84, p < .001.

Hierarchical regression analyses were similarly carried out using the print mediation scale categories to explain word reading. As shown in Table 5, with age, grade, nonverbal reasoning, and maternal education statistically controlled, the four

print mediation strategies collectively explained 10% unique variance in Chinese word reading, ΔF (4, 58) = 4.51, p<.01. However, only the copying strategy, from across the four strategies, emerged as a unique significant (and negative) predictor in the final regression model. Disappointingly, when I entered typical print mediation in step 2 with the same variables controlled in step 1 as shown in Table 5, it only explained 1% unique variance, a nonsignificant change, ΔF (1, 61) 1.18, p > .05.

Table 4.

Hierarchical Regression Explaining Chinese Word Recognition from Four Literate Mediation Variables and from the Typical Literate Mediation Variable in Study 1.

Step	Variable	Beta	t	R^2	ΔR^2	ΔF
1.	Age	.04	.27	.59	.59	22.35***
	Grade	.18	1.06			
	Nonverbal IQ	.08	.76			
	Mother's education	-.05	-.71			
2.	LM1	-.34	-2.59*	.70	.11	5.21**
	LM2	-.05	-.42			
	LM3	-.25	-2.73**			
	LM6	.29	2.83**			
1.	Age	.01	.10	.59	.59	22.35***
	Grade	.36	2.37			
	Nonverbal IQ	.16	1.65			
	Mother's education	-.03	-.35*			
2.	LMtypical	.41	3.84***	.67	.08	14.74***

Note: N=67. Variables controlled were children's age, grade, nonverbal IQ and mothers' education. LM1=model, LM2=stroke, LM3=visualization, LM6=morpheme

*p < .05; **p < .01; ***p < .001*

Table 5.

Hierarchical Regression Explaining Chinese Word Recognition from Four Print Mediation Variables and from the Typical Print Mediation Variable in Study 1.

Step	Variable	Beta	t	R^2	ΔR^2	ΔF
1.	Age	.10	.69	.59	.59	22.35***
	Grade	.27	1.58			
	Nonverbal IQ	.19	1.86			
	Mother's education	-.11	-1.31			
2.	PM1	-.35	-2.84**	.69	.10	4.51**
	PM2	-.32	-1.92			
	PM3	.13	1.47			
	PM4	-.03	-.25			
1.	Age	.12	.78	.59	.59	22.35***
	Grade	.43	2.42*			
	Nonverbal IQ	.23	2.16*			
	Mother's education	.02	.20			
2.	PMtypical	.11	1.09	.60	.01	1.18

Note: N=67. Variables controlled were children's age, grade, nonverbal IQ and mothers' education. LM1=model, LM2=stroke, LM3=visualization, LM6=morpheme

$*p < .05$; $**p < .01$; $***p < .001$

Discussion

Study 1 organized six strategies in literate mediation and four strategies in print mediation and documented their prevalence through the mother-child collaborative writing of Chinese words. In addition, we demonstrated a developmental trajectory of literate mediation, with mothers of kindergarteners tending to use strategies focusing on rote memorization, e.g., model or stroke, and mothers of first graders being more likely to use analytic strategies, e.g., focusing on meanings of the characters. Similarly, the print mediation scale showed that mothers allowed lower level writing autonomy for kindergartners compared to mothers of first graders. More importantly, the present study largely confirmed our attempt to validate the Chinese ordinal scales of literate

mediation and print mediation based on the studies of Aram and Levin (2001; 2004). Children's reading skills were positively associated with analytic strategies in literate mediation and higher autonomy strategies in print mediation, and negatively related to rote memorization strategies in literate mediation and lower autonomy strategies in print mediation. Moreover, literate mediation and print mediation contributed 8% to 11% unique variance to children's independent reading skills with children's age, grade, nonverbal reasoning ability and maternal education controlled.

Given the fact that traditionally Chinese reading and writing are acquired through repeated use of drill-and-practice, the findings in the present study may be significant in practical pedagogy. In contrast to the traditional enthusiasm for rote memorization (e.g., copying; emphasizing of strokes), these strategies tended to be negatively associated with Chinese word reading skills in the current study. Even with children's age, grade, nonverbal reasoning, and maternal education statistically controlled, regression analyses demonstrated that heavy reliance on rote memorization strategies was associated with lower reading performance. Perhaps more emphasis on aspects of the analytic approach should be considered for parents and researchers focused on literacy training programs for Chinese children. That is, the form and function of Chinese characters should be attended to more in future work, similar to the ideas advocated for teachers of Chinese for older students (e.g., Packard, Chen, Li, Wu, Gaffney, Li, & Anderson, 2006).

The relation between maternal mediation and children's literacy skills may be bidirectional, though this study was correlational only. That mothers of younger

children rely relatively heavily on lower level mediation strategies may be inevitable, because younger children can read and write fewer words than older children can. In line with Vygotsky's notion of the "zone of proximal development" (1978), it is likely that mothers' frequent use of less advanced strategies in kindergarteners may have occurred primarily because mothers mediated according to their children's individual abilities. Similar findings were demonstrated in a study in which Israeli mothers responded differently and sensitively to their own twins' individual literacy skills (Aram, 2007).

An exciting finding from the present study was the relatively strong positive association (r=.55) between the morpheme strategy used by mothers and children's word reading. This finding may partly reflect the fact that understanding of characters and subcharacter structures and functions requires deeper, more advanced cognitive processing than more surface-level strategies, e.g., rote memorization.

Because this study was perhaps the first investigation into maternal writing mediation in Chinese using this particular technique, the categories in the literate and print mediation scales were thought to be in need of further validation and possibly refinement. For example, for literate mediation, I wondered whether further dividing component segmentation strategies into component-focused and position-focused strategies might yield more information about mother-child interactions in word writing. Furthermore, the morpheme strategy level could also be categorized/divided separately in terms of strategies focused at the subcharacter and character levels as they reflect different aspects. For the print mediation scale, given that mothers heavily

relied on copying, I further considered distinguishing different types of copying strategies that mothers adopted for their children.

A second possible limitation of Study 1 was that children's literacy was measured only using our task of Chinese word reading. Although word reading seemed perhaps easiest to measure in this age group, I wondered how these scales would be associated with Chinese dictation/spelling skills as well.

Study 2 also looked at cross-cultural comparisons of maternal mediation in both Hong Kong and Beijing. Because Hong Kong society tends to encourage formal literacy activities earlier than any other Chinese society (e.g., Cheung & Ng, 2003; Li & Rao, 2000), I thought it might be important to compare maternal mediation strategies across groups from Hong Kong and Beijing. Moreover, given the importance of Pinyin for early reading development in Beijing, I further developed maternal mediation scales to examine Pinyin mediation in Study 3.

Finally, Study 1 did not analyze more socio-emotional mother-child interaction elements, such as mother's response/feedback on their children. I explored whether these, too, might be related to children's literacy skills development in Study 2, with additional scale development. All of these issues in Study 2 were considered in relatively diverse samples across cultures (Hong Kong VS Beijing) and age (kindergarteners vs. first graders).

Chapter Three Study 2

The first step in Study 2 was to refine both the literate and print mediation scales. Based on the results from Study 1 and additional pilot testing, refined scales of literate and print mediation scales adopted in Study 2 are presented in Figures 1 and 2. The refined literate mediation scale consisted of seven strategies with the modification focused on dividing the original segmentation strategy into component mediation and structure mediation and segmenting the original morpheme strategy as semantic radical mediation and character level mediation. In addition, I excluded the original modeling strategy in the refined literate mediation. The refined print mediation included five levels, and I expanded the original copy strategy into part by part copy (level 2) and whole character copy (level 3). I elaborate the refinement details below.

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

Level 2. Mother employs visual cues to help the child to visualize the character. For example, a mother points out that the right side of 扎 is visually similar to L.

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

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

Level 5. 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 夆.

Level 6. 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. 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 in Study 2.

Level 1. Mother holds child's hand and writes.

Level 2. Mother writes part and child copies part until the whole character is completed. For example, in writing 蛮, a mother first writes '丶' and then let the child copy this component, and then continues to write 心 and asks the child to copy it, and so on, until the whole character is complete.

Level 3. Mother writes the whole character first and then the child copies it. For example, in writing 蛮, a mother writes the entire 蛮 first and then asks the child to copy the whole character.

Level 4. Mother scaffolds the child in writing the character. For example, a child does not know how to write the phonetic component of the character 化 (flower), and the mother writes down that radical 化 only.

Level 5. Child writes the character on his/her own,with the mother monitoring the whole process and encouraging the child.

Figure 2. Refined print mediation scale in Study 2.

Refinement of the literate mediation scale was first focused on dividing the original segmentation strategies (LM4) into focusing on components, as well as focusing specifically on structure/position. To illustrate the specificities of component and structure within Chinese characters, Figure 3 demonstrates some of the features in a Chinese word, including the phonetic and semantic radical within a character, as well as how these are structured in a given character. As illustrated in Study 1, for the segmentation strategy, I counted both mothers' component segmentation and positional identification into this category, a single category. However, focusing on segmenting components and focusing on component positions are different conceptually. I wondered whether the Study 1 results showing that the frequency of the original component segmentation strategy was relatively high and that no differences across grades could be demonstrated may have been partly because that strategy was not differentiated enough. Thus, in the present study, I treated the pure component segmentation strategies as a lower level (For example, a mother says that 好 is composed of 女 and 子), and pointing out component position/structure as a higher level (For example, a mother says that 好 is a top-down structure, with the 女 at the top and 子 at the bottom). The importance of the internal structure within characters has been repeatedly demonstrated in previous studies (e.g., Shu & Anderson, 1997; Shu, Chen, Anderson, Wu, & Xuan, 2003). Because referring to character structure assumes some prior knowledge of components, I ordered it as higher than component mediation but lower than the explicit focus on sound (i.e., phonetic) or meaning (i.e., semantic) of the radicals because these latter ones likely

facilitate children's more functional and deeper understanding of Chinese characters.

Word	Character	Semantic radical	Phonetic radical	Structure
花瓶(vase)	花(flower)	艹	化	top-down
	瓶(bottle)	缶	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 缶 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 left and the phonetic radical at the right.

Figure 3. Examples of Chinese word decomposition in Study 2.

In addition to the above-mentioned refinement, I also categorized the morpheme level into the subcharacter and character categories. The lower one was at the semantic radical level, which is the focus on the within-character level. For example, in writing the character 蜂 (bee), a mother may explain that its semantic radical 虫 (insect) represents the fact that a bee is a kind of insect. The higher level was at the

whole character level, which covers mothers' explanation or comparison of the same character in different words and different characters with specific common characteristics. For example, in writing the character 李 in the word 行李 (luggage), a mother may tell the child that this character is the same as your surname (meaning that both are written as 李 and make the sound *li*). Another example would be that in writing 频 in the word 频果 (apple), a mother draws the child's attention to the fact that 频 and 瓶 in the word 花瓶 (vase) are homophones. I conceptualized this as the highest level because it implies that children have known/understood particular characters.

In reviewing the literate mediation scale, I decided to exclude the copying strategy in Study 2. This decision was made for a number of reasons. First, conceptually, literate mediation focuses on capturing mothers' decoding of characters, including a focus on stroke, component, or visualization; however, the copying strategy itself may reflect more on autonomy granting (print mediation) than the decoding process in any aspect. Second, as found in Study 1, kindergarten mothers asked children to copy 76% of the total characters partly because of the traditional "drill-and-practice" philosophy in teaching Chinese characters (Wu, Li, & Anderson, 1999), and these strategies were found to be relatively strongly negatively associated with Chinese literacy skills. In the present study, I aimed to highlight other decoding strategies which may be more effective in literacy acquisition. Thus, the refined literate mediation scale used in the present study was ordered as shown in Figure 1.

For print mediation, the refinement work only focused on dividing the copy level

into two categories: the lower level was part by part copying and the higher level was whole character copying (see Figure 2, levels 2 and 3). I conceptualized whole character copy as a higher-level strategy than part-by-part copying because whole character copying makes the child able to conceptual the whole character in mind and allows the child herself/himself to determine which part to begin first and which to write next.

Apart from these two scales, I further analyzed mothers' verbal responses/ comments on children and their writing, reflected in the commentary mediation descriptions as shown in Figure 4. The positive-negative dimension and process-outcome-person dimension are theoretically independent and one response could be analyzed in both dimensions. For example, the response "you are smart" could be coded into positive and person comments simultaneously.

Positive: positive evaluation of the child, e.g., "well done", "you are smart".

Negative: negative evaluation of the child, e.g., "No, this is wrong."

Process: specific responses to child's effort or strategy, e.g., "This line should be longer".

Outcome: broad responses to child's performance, e.g., "This character is beautifully written;" "This is not the right way to write the character."

Person: feedback focus on child's trait, e.g., "Don't be so silly".

Figure 4. Commentary mediation in Study 2.

Importantly, as justified in the introduction, I included a variety of metalinguistic/cognitive abilities, including orthographic awareness, morphological awareness, phonological awareness and visual skills for the following reasons: Firstly, given that maternal mediation and metalinguistic/cognitive abilities both focus on intra-character configuration and inter-character application as well, they may be associated with each other. Secondly, orthographic awareness (e.g., Ho, Chan, Lee, Tsang, & Luan, 2004; Ho, Chan, Tsang, & Lee, 2002; Shu & Anderson, 1997), morphological awareness (e.g., McBride-Chang, et al., 2003; Shu, McBride-Chang, Wu, & Liu, 2006; Wang, Cheng, & Chen, 2006), phonological awareness (e.g., McBride-Chang & Ho, 2000; Siok & Fletcher, 2001), and visual skills (e.g., Huang & Hanley, 1995; 1997) have been widely documented as important in Chinese literacy acquisition. Thus, in Study 2, I attempted to distinguish cognitive skills from mother-child interactions in relation to literacy acquisition.

The purposes of Study 2 were to investigate the nature of maternal mediation in three aspects, i.e., literate mediation, print mediation and commentary mediation, and their associations with children's independent cognitive/metalinguistic awareness and literacy skills in three groups of Hong Kong K3 children, Beijing K3 children, and Beijing P1 children. To be specific, I examined the following issues in Study 2. First, I analyzed the nature of mother-child writing interactions in three groups of Hong Kong K3, Beijing K3, and Beijing P1 children by using refined scales of literate mediation and print mediation scales, and examining components of commentary mediation. Second, I examined the relations of literate mediation and print mediation to visual

skills, metalinguistic awareness, and literacy skills in these three groups. Finally, I tested the relations of commentary mediation to literacy skills in these three groups.

Method

Participants

In Hong Kong, participants were 63 pairs of mothers and their children attending the third year of kindergarten in Hong Kong from seven kindergartens. There were 30 girls and 33 boys with a mean age of 5.81 years (range from 5.16 to 6.41 years, SD = .29). All children and mothers were native Cantonese speakers, and most were from families of a middle socioeconomic status (all from relatively new districts of Shatin and Ma On Shan in Hong Kong).

In Beijing, participants were 43 Chinese third year kindergarteners (21 girls and 22 boys) from one single kindergarten and their mothers, and 49 primary school first graders (22 girls and 27 boys) from one primary school and their mothers. The kindergarten third year children had a mean age of 6.16 years (range from 5.58 to 7.41 years, SD = 0.34), and first graders had a mean age of 7.29 years (range from 6.67 to 8.24 years, SD = .33). All children and their mothers were native Mandarin speakers from Beijing, and most were from families in the middle to high socioeconomic status range as reflected in their mothers' education level showed in the results section. All participants in Study 2 were different from those from Study 1.

Measures

Maternal mediation of Chinese character writing

This task was the same as that administered in Study 1 except that the number of

words included in the present task was different from Study 1, and that, different from Hong Kong mother-child pairs writing in traditional Chinese script, Beijing mothers and their children wrote in simplified Chinese script. However, all of the words were the same across the two cultures.

The selected words fell into five categories with the purpose of maximizing opportunities for using different strategies for writing facilitation, as in Study 1. As shown in Appendix 2, these five categories were homophones (孔雀--恐龙, peacock--dinosaur), homographs (行李 -- 银行 luggage--bank), reverse-ordered characters (蜜蜂 --蜂蜜, bee-honey), visually similar characters (兔子 --兔 子, free--rabbit), and same phonetic components and different semantic components (他们 -- 她们, they (male)—they (female)).

Both Hong Kong K3 children and Beijing P1 children and their mothers finished all of these twelve words, but the Beijing K3 children and their mothers only wrote eight of these words, i.e., 苹果 花瓶 (apple - vase), 他们 她们 (they (male) they (female)), 蜂蜜 蜜蜂 (honey - bee), 行李 银行 (luggage - bank) because of the children's relative low level in literacy skills. Most of these characters and words were the same as in Study 1; almost all of these characters were compound Chinese characters except for the character 子, which is a simple character, from the word 兔子 (rabbit). The reason for including so many compound characters was to reflect the reality that 90% of modern Chinese characters are compounds (Hoosain, 1991).

Mothers' education

In Hong Kong, mothers' education level was measured on a 7-point scale with 1 as primary 3rd grade or below, 2 as primary 4th grade to 6th grade, 3 as middle school 1st-5th grade, 4 as middle school 6th-7th grade, 5 as college, 6 as university and 7 as postgraduate level.

Slightly different from Hong Kong, in Beijing, middle school is a three-year education system and after that there is a three-year high school education. Thus, with other points remaining the same on the same 7-point scale, point 3 was changed to middle school, and point 4 was changed to high school.

Non-verbal reasoning

This measure was the same as that used in Study 1 and it was administered to all Hong Kong and Beijing children. The maximum possible score on this task was 24.

Visual spatial relationships

The same task was tested across three groups from Hong Kong and Beijing. The visual spatial relationships task (Gardner, 1996) aims to assess children's spatial orientation and is comprised of sixteen items. For each item, children were asked to select the target figure that was partly or holistically presented in a different orientation from the other four simultaneously presented figures.

Chinese word recognition

The same task as was used in Study 1 for Chinese word recognition was used for Hong Kong K3 children, and the maximum possible score was 211.

In Beijing for both kindergarten children and first graders, a test of one hundred single Chinese characters, presented in order of increasing levels of difficulty, was

used. Children were asked to read from the beginning to the end, and the testing stopped after 10 failures in a row. A similar task has been successfully used by McBride-Chang et al (2005).

Chinese word writing

All children completed this task. The experimenter dictated the words twice loudly and the child was asked to write the dictated word independently on a sheet of paper with a pen. Throughout the task, children were encouraged to try their best to write down the characters they thought were correct. I scored word writing by the character, rather than the whole word, to maximize variability on the task; thus one mark was credited for each correctly written character.

As shown in Appendix 3, 14 words (4 single-character words and 10 two-character words) were selected, ranging from easy to difficult, from standard textbooks of kindergarten and primary schools. All of these words were orally familiar to children.

Hong Kong K3 and Beijing P1 children were give all 14 words, whereas Beijing K3 children only wrote 10 words (3 single-character words and 7 two-character words) as indicated in Appendix 3. Thus the maximum score for Hong Kong K3 and Beijing P1 children was 24 points each, respectively, and for Beijing K3 children was 17 points. Throughout the task, Hong Kong children wrote in traditional Chinese and Beijing children wrote in simplified Chinese.

Phonological awareness

This task included both syllable deletion and phoneme deletion. For the syllable

deletion task, a three-syllable phrase was orally presented by an experimenter, and children were asked to delete one of the syllables and say aloud the new phrase. For example, *dà mén kǒu* without saying *mén* would become *dà kǒu*. For phoneme deletion task, children were asked to orally delete a phoneme either from the initial, middle or final position of a word. For example, *tōu* without the initial phoneme would be *ōu*. These tasks have been used in previous studies among both Mainland Chinese Children (McBride-Chang, et al. 2005) and Hong Kong children (McBride-Chang & Ho, 2000; McBride-Chang & Kail, 2002).

In the present study, for Hong Kong children, 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). Nonsense words were included to increase the task difficulties. The maximum possible score for the syllable deletion task was 29 points and for the phoneme deletion task was 22 points for the Hong Kong children. For Beijing children, there were 16 syllable deletion items (6 initials, 6 middles and 4 finals, all real words) and the total score was 16 points. There were also 20 phoneme deletion items (10 initials, 5 middles and 5 finals, all real words) and the total score was 20 points among the Beijing samples. Throughout the task, Hong Kong children were presented all items orally in Cantonese, whereas Beijing children were presented with these items in Mandarin.

Morphological construction

In this task, children are asked to combine familiar morphemes to create new

compound words within the context of a three-sentence story. For example, one story 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 from the top of the mountain?" The correct answer would be "*morning scene*." There were 27 items and the maximum possible score was 27 points. Similar tasks have been used in previous work (e.g., McBride-Chang, Shu, Zhou, Wat, & Wagner, 2003). The same morphological construction task with the same items was administered in both Hong Kong and Beijing.

Orthography-semantic awareness

This task, originally developed by Tong & McBride-Chang (under review), was used to assess children's awareness of both semantic radicals and their position within a given character. Children were visually presented a picture together with four nonsense characters at the bottom of the picture and were asked to select the one nonsense character that best represented the meaning of the picture. The correct answer usually was the nonsense character with the correct semantic radical in the correct position. For example, a picture of 花 (flower) and four nonsense characters, 笠, 佸, 苍 and 沱 were given, and the correct answer was 苍 because its semantic radical 艹 (meaning plant) best resembled the meaning of flower among the four, and it was placed in the upper position in line with conventional rules of Chinese character composition. There are 32 items and the maximum score was 32 points. Across Hong Kong and Beijing, the same items were used but adapted for traditional/simplified Chinese script.

Orthographic awareness

This task was used to assess children's awareness of the internal structures of Chinese characters. It consisted of 30 real characters, 20 noncharacters, 10 pseudocharacters, and 10 visual symbols. Children were visually presented with each item and asked to identify whether or not each presented item was a real character. The correct answers for all noncharacters, pseudocharacters and visual symbol items were "no" (not a real character) and for those 30 real characters, the answer was "yes" (real character). One point was allotted for a correctly identified item, and the maximum score for this task was 70 points.

Across three groups in Hong Kong and Beijing, the same task was administered, with a few modifications of items to fit the traditional /simplified Chinese script. This task has also been used in previous studies. For example, Tong, McBride-Chang, Shu, and Wong (in press) used it on Hong Kong children.

Procedure

In Hong Kong, measures of maternal mediation of word writing, 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 word recognition, Chinese word writing, visual skills, morphological construction, and orthography-semantic awareness 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.

In Beijing for both K3 and P1 children, the same four tasks of maternal mediation of character writing, phonological awareness, orthographic awareness, Raven's non-verbal reasoning, as well as demographic information were obtained at children's homes, and the remaining measures were tested in kindergarten/primary schools on separate days. The order of home and school sessions was randomly varied across participants. The maternal mediation of character writing task typically took approximately 30 minutes for Beijing K3 children and 15 minutes for P1 children. The instructions given to mothers were the same across Hong Kong and Beijing.

All videotapes were coded by trained student helpers who were unaware of the study hypotheses, with Hong Kong mother-child collaborative writing coded by a Cantonese speaker and Beijing mother-child collaborative writing coded by a Mandarin speaker. The same criteria were consistently applied to each case according to the scales refined in the present study. To obtain the inter-rater reliabilities, I had some cases (approximately 20%) double coded in each group. For Hong Kong K3 children, I had 13 cases (21%) double coded by another coder, and the inter-rater reliability of Kappa = .85 for literate mediation and Kappa = .71 for print mediation. For commentary mediation, the correlations were r = .79, .88, .71, .65, and .70 for positive, negative, process, outcome, and person comment respectively. For Beijing children, I had 10 cases (23%) among K3 children and 10 cases (20%) among P1 children double coded. The obtained inter-rater reliability for Beijing K3 children were Kappa = .85 for literate mediation and Kappa = .74 for print mediation, and for P1 children were Kappa = .65 for literate mediation and Kappa = .83 for print

mediation. For commentary mediation, the correlations were r = .82, .80, .68, .64, and .72 for positive, negative, process, outcome, and person comment respectively in Beijing K3 children and r = .73, .70, .62, .60, and .54 for positive, negative, process, outcome, and person comment respectively in Beijing P1 children.

The way in which I computed the maternal mediation scores for literate mediation and print mediation scales was the same as I did in Study 1 by using the following filter mechanism. I excluded 8.93%, 3.78%, and 56.80% characters for Hong Kong K3, Beijing K3 and Beijing P1 children respectively because those characters were written by children independently or accidently unrecorded by the videotape.

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

Moreover, as in Study 1, I calculated the typical mediation level by selecting the strategy mothers used with the highest frequency. If two or more strategies shared the same highest frequency, the one with the most advanced level was selected. In conducting statistic analyses of correlation and regression, typical mediation levels of both literate mediation and print mediation were used to represent the maternal mediation score of each scale.

For commentary mediation, I first recorded the frequencies of mothers' comments on each category. The positive-negative dimension and process-outcome-person dimension could be double coded. For example, a mother responded to her child: "Good, this character is beautifully done". This was counted into both the positive category and the outcome category. Then I averaged the comment frequency on each

category across those characters the mother at least commented on via one type of response category and obtained commentary mediation scores for each category. Thus, the commentary mediation score indicates the frequency of a particular type of response a mother comments on for a given character. I counted out those characters that mothers did not have any response for because by definition in these characters mothers' comments were not involved, and moreover, the relative frequency of each type of response was of the most interest. In addition, I also excluded those characters that mothers skipped or which were not recorded by the videotape. In total an average of 42.83%, 20.43%, and 54.08% of the total characters were counted out from analyses for mothers of Hong Kong K3, Beijing K3, and Beijing P1 groups respectively.

Results

Results are reported in the following four sections: 1) Descriptive statistics of all measures and comparisons among three groups, 2) the relations of literate mediation to meta-linguistic awareness and literacy skills in three groups, 3) the relations of print mediation to meta-linguistic awareness and literacy skills in three groups, 4) the relations of commentary mediation to literacy skills in three groups.

Descriptive statistics of all measures and comparisons among the three groups

Table 6 shows the means, standard deviations, *F* values, and paired comparisons for literate mediation, print mediation, and commentary mediation variables in the groups of Hong Kong K3 (HKK3), Beijing K3 (BJK3) and Beijing first grade (BJP1) children.

For the literate mediation scale, Beijing mothers tended to focus on the stroke strategy (LM1) in kindergarten children and then decreased in first grade. As in Study 1, relatively few mothers used the visualization (LM2) and phonetic function (LM5) strategies across all three groups. Interestingly, Hong Kong mothers used more visualization (LM2) and component segmentation (LM3) strategies than did Beijing mothers. In contrast, Beijing mothers tended to use more structure focused (LM4) and character level mediation (LM7) strategies than did Hong Kong mothers. In addition, the semantic function (LM6) strategy appeared to show no differences across groups. As in Study 1, the most frequently used level of literate mediation was much lower for mothers of kindergarten children (2.32 for HKK3, 2.51 for BJK3) than for mothers of first graders (4.63 for BJP1).

For the print mediation scale, mothers of Hong Kong K3 children were more likely to hold children's hand (LM1) to write than were mothers of Beijing K3 and P1 children. Kindergarten mothers made use of more part by part copying (LM2) for their children than did those of P1 children. Similarly, kindergarten mothers were more likely to engage in the whole character copying (LM3) strategy than were P1 mothers. However in contrast, first grade mothers tended to engage in scaffolding (LM4) and monitoring (LM5) much more than did kindergarten mothers. In general, a striking phenomenon is that mothers in all three groups were largely engaged in helping their child to copy the whole character in the dyad writing interaction. The most frequently used level in print mediation was relatively low for kindergarten mothers (2.81 for HKK3, 2.93 for BJK3), and high for first grade mothers (3.65 for

BJP1).

For commentary mediation, in the positive-negative dimension, Beijing K3 mothers had the highest frequency of both positive and negative comments among these three groups and they commented positively and negatively with the same frequency, t (42) = .04, p=.97. Hong Kong K3 mothers tended to give more negative responses than positive responses, t (61) = 5.79, p<.001. However, Beijing P1 mothers responded more positively than negatively, t (48) = 2.05, p< .05. In the process-outcome-person dimension, overall very few mothers commented on the person-related dimension across the three groups. Hong Kong mothers focused more on process comments, whereas both Beijing K3 and P1 mothers tended to use outcome comments.

Table 6.

Estimated Mean Scores and Standard Deviations of Maternal Mediation Scales across Hong Kong Kindergarten Third Grade (HKK3), Beijing Kindergarten Third Grade (BJK3), and Beijing Primary School First Grade (BJP1), and the F Values for Univariate Test of Group Differences in Study 2.

Task/Group	HKK3 N= 63	BJK3 N=43	BJP1 N 49	F-value	Pairwise comparisons by LSD
	Mean (S.D.)	*Mean (S.D.)*	*Mean (S.D.)*	*F (2, 152)*	
Literate mediation					
LM1 (1)	.50 (.25)	.51 (.32)	.10 (.14)	46.77***	HKK3 ·BJK3 · BJP1
LM2 (1)	.08 (.12)	.02 (.04)	.01 (.04)	11.31***	HKK3 ·BJK3 BJP1
LM3 (1)	.42 (.19)	.32 (.20)	.25 (.16)	12.81***	HKK3 ·BJK3 BJP1
LM4 (1)	.14 (.15)	.38 (.25)	.43 (.18)	35.29***	HKK3· BJK3 BJP1
LM5 (1)	.00 (.01)	.00 (.02)	.02 (.05)	5.26**	HKK3 BJK3· BJP1
LM6 (1)	.11 (.13)	.11 (.12)	.12 (.14)	.05	HKK3 BJK3 BJP1
LM7 (1)	.19 (.14)	.25 (.14)	.29 (.19)	5.86**	HKK3· BJK3 BJP1
LMtypical (7)	2.32 (1.61)	2.51 (1.76)	4.63 (1.44)	32.70***	HKK3 BJK3· BJP1
Print mediation					
PM1 (1)	.09 (.20)	.02 (.09)	.01 (.07)	4.80*	HKK3 ·BJK3 BJP1
PM2 (1)	.16 (.30)	.16 (.32)	.01 (.03)	5.73**	HKK3 BJK3 · BJP1
PM3 (1)	.66 (.36)	.82 (.33)	.43 (.28)	16.72***	BJK3 ·HKK3 BJP1
PM4 (1)	.09 (.13)	.02 (.06)	.26 (.19)	36.18***	BJK3 HKK3· BJP1
PM5 (1)	.06 (.09)	.02 (.09)	.30 (.23)	50.94***	HKK3 ·BJK3· BJP1
PMtypical	2.81 (.53)	2.93 (.46)	3.65 (.93)	24.20***	HKK3 BJK3· BJP1
Commentary mediation					
Positive	.63 (.50)	1.29 (.82)	.81 (.31)	17.82***	HKK3 BJP1· BJK3
Negative	1.21 (.55)	1.29 (.69)	.64 (.38)	20.70***	HKK3 BJK3 · BJP1
Process	1.14 (.65)	.90 (.61)	.26 (.27)	36.50***	HKK3 ·BJK3 · BJP1
Outcome	.50 (.26)	1.62 (.77)	1.16 (.35)	71.48***	HKK3· BJP1· BJK3
Person	.18 (.20)	.06 (.09)	.03 (.07)	18.06***	HKK3 ·BJK3· BJP1

Note: LM1=stroke, LM2=visualization, LM3=component, LM4=structure, LM5=phonetic function, LM6=semantic function, LM7=character, LMtypical= most frequently used level in literate mediation, PM1= hand holding, PM2=copy part by part, PM3= whole character copy, PM4=scaffolding, PM5=monitoring and children writing on own, PMtypical= most frequently used level in print mediation.

*$p < .05$; **$p < .01$; ***$p < .001$

Means, standard deviations, and reliabilities for all other 11 measures apart from the maternal mediation variables reported above for the Hong Kong K3, Beijing K3 and Beijing P1 children are shown in Table 7. Overall, most measures were normally distributed with good variability and internal consistency reliability. However, for Hong Kong K3 and Beijing K3 children, the reliabilities for the ortho-semantic measure were very low, indicating that this measure may not have been appropriate for kindergarten children. Moreover, there were children (in one or more groups) demonstrating floor or ceiling effects on the measures of syllable deletion and phoneme deletion. Thus, these measures were not used in the following analyses for their corresponding groups as noted in Table 7. The maternal education levels indicated that our participants were from families with middle to high socio-economic status.

Most measures across Hong Kong and Beijing were somewhat different in detailed items or item numbers because of the measurement localization; thus, direct comparisons of these measures across Beijing and Hong Kong are meaningless, except for the measures of visual spatial relationship, orthographic awareness and morphological awareness, because they were exactly the same items. On this visual task, an *F*-test showed that Beijing P1 children performed significantly better than did Beijing K3 children, who were significantly better than Hong Kong K3 children, $F(2, 152) = 30.09$, $p<.001$. The same results were found on the morphological awareness task, $F(2, 152) = 131.46$, $p<.001$. Beijing P1 children performed best, and Hong Kong K3 children did worst. On the orthographic task, the F-test suggested a significant difference among groups, $F(2, 152) = 49.19$, $p<.001$, and paired comparison showed that Beijing P1 children did better than either Beijing K3 or Hong Kong K3 children, whereas K3 children across these two locations performed

similarly.

Table 7.
Estimated Mean Scores, Standard Deviations and Reliabilities of Cognitive Measures across Hong Kong Kindergarten Third Grade (HKK3), Beijing Kindergarten Third Grade (BJK3), and Beijing Primary School First Grade (BJP1) in Study 2.

Task/Group	HKK3 (N = 63)		BJK3 (N = 43)		BJP1 (N = 49)	
	Mean (S.D.)	Cronbach's α	*Mean (S.D.)*	Cronbach's α	*Mean (S.D.)*	Cronbach's α
Word recognition (211)	66.52 (31.95)	.98	--	--	--	--
Character recognition (100)	--	--	27.35 (23.87)	.99	60.80 (14.92)	.96
Word writing (24)	7.30 (3.18)	.74	--	--	19.12 (2.11)	.51
Word writing (17)	--	--	4.58 (2.89)	.77	--	--
Non-verbal reasoning (24)	13.38 (3.28)	.69	16.05 (3.97)	.80	20.02 (2.56)	.67
Maternal education (7)	3.73 (1.23)	--	6.19 (.76)	--	5.50 (.97)	--
Visual spatial (16)	11.46 (2.98)	.71	13.37 (3.21)	.80	15.33 (1.13)	.53
Orthographic awareness (70)	42.43 (8.55)	.81	44.19 (12.01)	.91	58.08 (4.77)	.69
Phonological awareness (51)	22.78 (10.13)	.94	--	--	--	--
Syllable deletion (16)	--	--	14.28 (2.15)	.87	15.18 (2.32)[c]	.91
Phoneme deletion (20)	--	--	1.58 (3.13)[b]	.83	19.00 (3.01)[c]	.94
Morphological construction (27)	12.46 (4.94)	.86	21.49 (4.01)	.84	23.87 (1.53)	.42
Ortho-semantic test (32)	9.44 (2.65)	.17[a]	7.98 (2.25)	.11[a]	16.50 (4.02)	.70

Note: Dash means the measure was not applicable to the particular group. All reliabilities were the internal consistency reliabilities. a indicates low reliability, b indicates floor effect, c indicates ceiling effect. Measures marked with a, b, c were not used in further analyses.
$^{*}p < .05$; $^{**}p < .01$; $^{***}p < .001$

Relations of literate mediation to meta-linguistic awareness and literacy skills in three groups

In the following correlational and regression analyses, I used the typical mediation levels of both literate mediation and print mediation to represent each scale's maternal mediation scores. These typical level scores were developed in Study

1, and the strategies documented in Study 2 largely replicated the results of Study 1. I first present the results of relations among literate mediation, metalinguistic awareness, and literacy skills across three groups of Hong Kong K3 children, Beijing K3 children, and Beijing P1 children. Print mediation and commentary mediation are presented later on.

Hong Kong K3 children

Correlations among all cognitive/metalinguistic and literate mediation measures for Hong Kong K3 children are presented in Table 8. Typical literate mediation level was found to be significantly associated with Chinese word recognition (r = .58, p < .001) and character writing (r = .29, p < .05), as well as visual skills and orthographic awareness. In addition, Chinese word recognition 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 literate mediation and cognitive components contributed to Chinese word recognition and writing respectively among Hong Kong K3 children, I conducted a hierarchical regression analysis as shown in Table 9. I first statistically controlled maternal education, children's non-verbal reasoning, and visual skills in step 1. These were assumed as family background and children's nonverbal cognitive skills. In step 2, phonological awareness, morphological construction, and orthographical awareness, all important metalinguistic skills related to early reading development, were included and collectively explained 19% unique variance in Chinese character recognition, ΔF (3, 52) = 4.69, p < .01 and 13% unique variance in Chinese character writing, ΔF (3, 52) = 3.20, p < .05. Finally, the literate mediation scale in step 3 further contributed 15% unique variance to Chinese word recognition, ΔF (1, 51) = 14.58 , p < .001, but only

1% unique variance for Chinese character writing, ΔF (1, 51) = .84, p = .37). In these equations, 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).

Table 8.
Correlations among Visual skills, Metalinguistic Awareness, Chinese Word Recognition, Chinese Word Writing, Literacy Mediation, and Print Mediation among Hong Kong K3 Children in Study 2.

Variables	1	2	3	4	5	6	7	8
1. Word recognition	--							
2. Word writing	0.72***	--						
3. Visual spatial relationship	0.36**	0.41**	--					
4. Orthographic awareness	0.49***	0.32*	0.36**	--				
5. Morphological construction	0.24†	0.30*	0.27*	0.27*	--			
6. Phonological awareness	0.35**	0.50***	0.36**	0.25*	0.34**	--		
7. Literate mediation	0.58***	0.29*	0.26*	0.28*	0.21†	0.08	--	
8.Print mediation	0.30*	0.23†	0.22†	0.09	0.13	0.18	0.41**	--

Note: N=63. † $p < .10$, *$p < .05$; **$p < .01$; ***$p < .001$

Table 9.

Hierarchical Regression Explaining Chinese Word Recognition and Chinese Word Writing from Mate-linguistic Awareness and Literate Mediation with Mother's Education, Children's Non-Verbal IQ., and Visual Skills Controlled among Hong Kong K3 Children in Study 2.

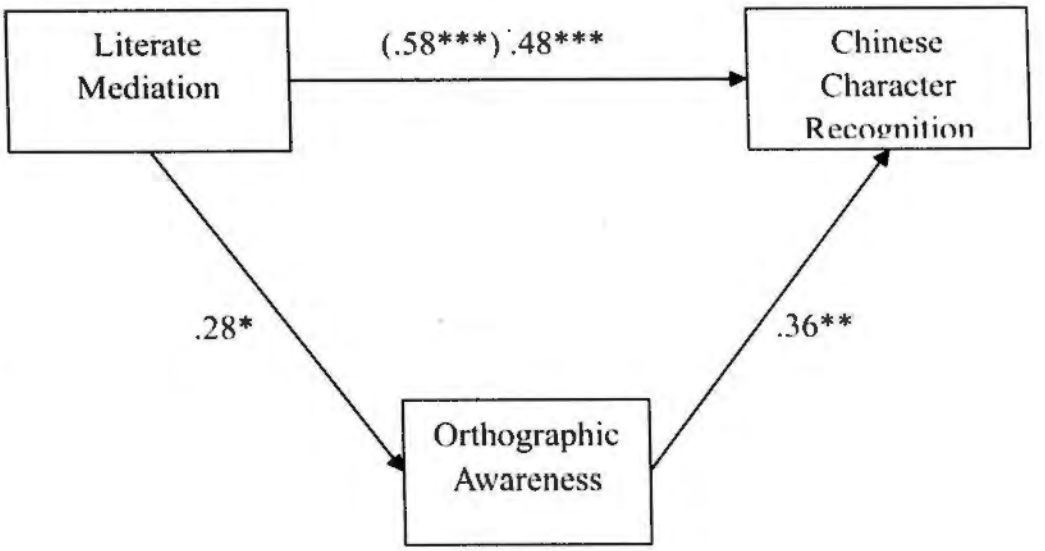
		Chinese word recognition				Chinese word writing			
Step	Variables	Beta	T	R^2	ΔR^2	Beta	t	R^2	ΔR^2
1.	Mother's education	-.03	-.29	.13	.13	-.03	-.26	.18	.18
	Non-verbal IQ	-.00	-.01			.07	.47		
	Visual skills	.06	.50			.14	1.01		
2.	Phonological awareness	.22	1.82†	.31	.19	.34	2.49*	.31	.13
	Morphological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

Note: N=63. † $p < .10$, *$p < .05$; **$p < .01$; ***$p < .001$

As defined in the introduction, orthographic awareness here refers to the knowledge of specific radical positions and functions, and effective literate mediation includes the process by which mothers decompose Chinese characters into various components and then regroup them into a square linguistic unit. Theoretically there is a common underlying mechanism between orthographic awareness and literate mediation. In addition, the above correlational and regression results showed that orthographic awareness was associated with both literate mediation and Chinese character reading and writing. Thus, I was interested in whether orthographic awareness might function as a possible mediator in the relation between literate mediation and Chinese word reading and writing and tested this association as described below.

Regression analyses were conducted to test these hypotheses. I adopted the three

criteria set by Baron and Kenny (1986): First, the initial variable should predict the outcome; second, the initial variable should predict the mediator; finally, the mediator should predict the outcome variable, even after the initial variable is included in the same model. With regression analyses, I found one mediation effect, i.e., that the relation between literate mediation and Chinese character reading was partially mediated by orthographic awareness (Figure 5). In the first equation, literate mediation (the initial variable) significantly explained Chinese word reading (the outcome measure), $\beta = .58$, $t = 5.59$, $p < .001$, and orthographic awareness (the mediator), $\beta = .28$, $t = 2.25$, $p < .05$. Finally, when literate mediation and orthographic awareness were entered together in a regression equation to explain Chinese word reading, orthographic awareness continued to explain Chinese character reading, $\beta = .36$, $t = 3.60$, $p < .01$, as well as literate mediation, $\beta = .48$, $t = 4.88$, $p < .001$. The Sobel (1982) test for this mediation model was significant, $z = 3.54$, $p < .001$. Thus, our results suggested that orthographic awareness functioned as a partial mediator in the relation between literate mediation and the Chinese character reading among Hong Kong K3 children.



Notes. The value in parentheses is the regression coefficient for predicting Chinese character recognition from literate mediation without the mediator (orthographic awareness). *$p < .05$. **$p < .01$. ***$p < .001$.

Figure 5. Orthographic awareness as a mediator between literate mediation and Chinese character recognition among Hong Kong K3 children in Study 2.

Beijing K3 children

Correlations among all cognitive/metalinguistic and maternal mediation measures for Beijing K3 children are presented in Table 10. Literate mediation was significantly correlated with Chinese character reading and writing, as well as syllable deletion. Moreover, Chinese character reading was found to be correlated with all the measures of cognitive skills and metalinguistic variables, especially highly associated with orthographic awareness ($r = .50$, $p < .01$), and morphological construction ($r = .45$, $p < .01$). However, Chinese character writing was found to be also associated orthographic awareness, and highly correlated with visual skills ($r = .50$, $p < .01$).

Table 10.

Correlations among Visual Skills, Metalinguistic Awareness, Chinese Character Recognition, Chinese Word Writing, Literacy Mediation, and Print Mediation among Beijing K3 Children in Study 2.

Variables	1	2	3	4	5	6	8	9
1. Character recognition	-							
2. Word writing	0.51**							
3. Visual spatial relationship	0.38*	0.50**						
4. Orthographic awareness	0.50**	0.31*	0.33*	- -				
5. Morphological construction	0.45**	0.19	0.50**	0.46**				
6. Syllable deletion	0.33*	0.20	0.32*	0.39*	0.44**			
7. Literate mediation	0.41**	0.35*	0.11	0.01	0.06	0.32*		
8. Print mediation	.31*	.46**	.05	.16	.06	.10	.40**	

Note: N=43. † $p < .10$, *$p < .05$; **$p < .01$; ***$p < .001$

As shown above for Hong Kong K3 children, to further examine the extent to which literate mediation and cognitive/metalinguistic measures explained Chinese character reading and writing among Beijing K3 children, I conducted another set of hierarchical regression analyses for this group. Just as done previously for the Hong Kong K3 data, I entered the same three variables of maternal education, children's non-verbal IQ and visual skills in step 1, and morphological construction, orthographic awareness and phonological awareness as reflected in the measure of syllable deletion in step 2, and literate mediation in step 3. As shown in Table 11, with step 1 variables controlled, step 2 metalinguistic awareness collectively explained 22% unique variance for Chinese character reading, $\Delta F\,(3, 32) = 4.21$, $p < .05$, and 13% unique variance for Chinese character writing, $\Delta F\,(3, 32) = 1.75$, $p = .18$. Even with step 2 further controlled, literate mediation in step 3 explained 11% unique variance for Chinese reading, $\Delta F\,(1, 31) = 7.90$, $p < .01$, and 25% unique variance for Chinese writing, $\Delta F\,(1, 31) = 14.74$, $p < .01$. In the final equations, orthographic awareness and literate mediation appeared to be significant correlates for Chinese reading ($t = 3.06$, $p < .01$; $t = 2.81$, $p < .01$ respectively) and writing ($t = 2.81$, $p < .01$; $t = 3.84$, $p < .01$ respectively).

Table 11.

Hierarchical Regression Explaining Chinese Character Recognition and Chinese Character Writing from Meta-linguistic Awareness and Literate Mediation with Mothers' Education, Children's Non-Verbal IQ., and Visual Skills Controlled among Beijing K3 Children

		Chinese character recognition				Chinese word writing			
Step	Variables	Beta	t	R^2	ΔR^2	Beta	t	R^2	ΔR^2
1.	Mother's education	.09	.74	.22	.22	-.02	-.17	.08	.08
	Non-verbal IQ	.22	1.47			.09	.55		
	Visual skills	-.08	-.46			.05	.25		
2.	Phonological awareness	-.12	-.76	.44	.22	-.16	-.93	.21	.13
	Morphological construction	.25	1.52			-.13	-.73		
	Orthographic awareness	.47	3.06**			.47	2.81**		
3.	Literate mediation	.36	2.81**	.55	.11	.54	3.84**	.47	.25

Note: N=43. † $p < .10$, *$p < .05$; **$p < .01$; ***$p < .001$

As tested for the Hong Kong K3 group, I was interested in possible mediation effect of metalinguistic awareness in the associations between literate mediation and Chinese reading and writing skills among Beijing K3 children. However,as shown in Table 10, only syllable awareness was correlated with both literate mediation and Chinese reading and writing for the Beijing group. Maybe because of the Pinyin instruction in Mainland China, phonological awareness is salient in the relation between literate mediation and literacy skills. The same three criteria set by Baron and Kenny (1986) was used to test this question of mediation, therefore. However, it did not meet the third criteria that the mediator should predict the outcome even with the initial variable entered into regression equation. When syllable deletion and literate mediation measures were both entered into the regression equations in predicting Chinese reading and writing, syllable deletion was nonsignificantly associated, $\beta = .22$, $t = 1.45$, $p = .16$ for predicting reading, and $\beta = .00$, $t = -.00$, p

= .10 for predicting writing. Thus, none of these included metalinguistic measures functioned as a mediator in the relation between literate mediation and literacy skills in Beijing K3 children.

Beijing P1 children

Correlations among all cognitive/metalinguistic measures and literate mediation for Beijing P1 children are reported in Table 12. Disappointingly, literate mediation did not correlate with either Chinese character reading or writing in this sample; it only correlated with visual skills among all the measures. In addition, Chinese character recognition was associated with orthographic awareness, whereas Chinese word writing was related to visual skills (marginal significance) orthographic awareness, and the ortho-semantic test.

Table 12

Correlations among Visual skills, Metalinguistic Awareness, Chinese Character Recognition, Chinese Word Writing, Literacy Mediation, and Print Mediation among Beijing P1 Children in Study 2.

Variables	1	2	3	4	5	6	7	8
1. Character recognition	--							
2. Word writing	0.59***	--						
3. Visual spatial relationship	0.07	0.27†						
4. Orthographic awareness	0.48***	0.37**	-0.08	--				
5. Morphological construction	0.07	0.19	0.20	0.08				
6. Ortho-Semantic test	0.05	0.42**	0.13	0.02	-0.07	--		
7. Literate mediation	-0.07	-0.12	0.29*	-0.07	0.15	-0.05		
8. Print mediation	.09	.30*	.21	.32*	.04	.19	.03	

Note: N=49. † $p < .10$, *$p < .05$; **$p < .01$; ***$p < .001$

To summarize, literate mediation was significantly correlated with Chinese word reading and writing in kindergarten children from both Hong Kong and Beijing, and it explained substantial unique variance in these literacy skills even with general background, cognitive skill and metalinguistic awareness statistically controlled. In contrast, no significant associations of literate mediation to other variables except visual skills were found in Beijing P1 children. In addition, in Hong Kong K3 children, orthographic awareness partially mediated the relation between literate mediation and Chinese character reading, but this association was not found for the Beijing K3 children.

Relations of print mediation to metalinguistic awareness and literacy skills in three groups

Print mediation was found to be significantly correlated with Chinese word reading but only marginally significantly correlated with Chinese word writing in Hong Kong K3 children as shown in Table 8. Moreover, there was a positive association of print mediation and literate mediation ($r = .41$, $p < .01$). With children's age, non-verbal reasoning and maternal education statistically controlled, print mediation was nonsignificant in explaining either Chinese word reading or writing in this study, as shown in Table 13.

For Beijing K3 children, as reported in Table 10, print mediation was significantly correlated with Chinese character reading ($r = .31$, $p < .05$) and Chinese character writing ($r = .46$, $p < .01$), as well as literate mediation ($r = .40$, $p < .01$). To examine whether print mediation explained unique variance in Chinese reading and

writing, I conducted a hierarchical regression analysis, as shown in Table 14. With children's age, non-verbal reasoning, and maternal education statistically controlled, print mediation explained 13% unique variance in Chinese character reading, ΔF (1, 38) = 8.40, $p < .01$, and 22% unique variance in Chinese character writing ΔF (1, 38) = 12.40, $p < .01$. Print mediation was a significant unique correlate for both Chinese character reading (t 2.90, $p < .01$) and writing (t 3.52, $p < .01$).

For Beijing P1 children, Table 12 shows that print mediation was significantly correlated with Chinese character writing and orthographic awareness, but not Chinese character reading. The hierarchical regression equation in Table 15 shows that with children's age, non-verbal reasoning, and maternal education statistically controlled, print mediation explained Chinese character writing only marginally significantly, t = 2.90, $p < .10$ (7% of unique variance, ΔF (1, 43) 3.42, p .07).

These print mediation results were disappointing compared to the results in Study 1. Basically the results showed that only in the Beijing K3 sample was higher order print mediation (more autonomy in writing) associated with better reading and writing, but no such strong relations were found in the Hong Kong K3 and Beijing P1 samples. This may be because our scale may not discriminate enough given that mothers largely use copy strategies, or may reflect the fact that print mediation in Chinese may not be as consistently important as previous studies have found for alphabetic scripts (Aram & Levin, 2001, 2004). The results showed that in the kindergarten samples, the print mediation scale was consistently correlated with literate mediation, suggesting that the higher order decoding strategies mother used, the higher the autonomy a

mother allowed for her child in writing.

Table 13.

Hierarchical Regression Explaining Chinese Word Recognition and Chinese Word Writing from Print Mediation with Mother's Education, Children's Age and Non-Verbal IQ Controlled among Hong Kong K3 Children in Study 2.

		Chinese word recognition				Chinese word writing			
Step	Variables	Beta	t	R^2	ΔR^2	Beta	t	R^2	ΔR^2
1.	Children's age	.13	.91	.13	.13	-.03	-.17	.16	.16
	Non-verbal IQ	.26	1.85†			.40	2.91**		
	Mother's education	.08	.61			.09	.71		
2.	Print mediation	.18	1.35	.16	.03	.10	.81	.18	.01

Note: N=63. † $p < .10$, *$p < .05$; **$p < .01$; ***$p < .001$

Table 14.

Hierarchical Regression Explaining Chinese Character Recognition and Chinese Word Writing from Print Mediation with Mother's Education, Children's Age and Non-Verbal IQ Controlled among Beijing K3 Children in Study 2.

		Chinese character recognition				Chinese word writing			
Step	Variables	Beta	t	R^2	ΔR^2	Beta	t	R^2	ΔR^2
1.	Children's age	.43	3.38**	.30	.30	.20	1.45	.10	.10
	Non-verbal IQ	.22	1.76†			.18	1.33		
	Mother's education	.25	2.04*			.12	.92		
2.	Print mediation	.37	2.90**	.43	.13	.48	3.52**	.32	.22

Note: N=43. † $p < .10$, *$p < .05$; **$p < .01$; ***$p < .001$

Table 15.

Hierarchical Regression Explaining Chinese Character Recognition and Chinese Word Writing from Print Mediation with Mother's Education, Children's Age and Non-Verbal IQ Controlled among Beijing P1 Children in Study 2.

		Chinese character recognition				Chinese word writing			
Step	Variables	Beta	t	R^2	ΔR^2	Beta	t	R^2	ΔR^2
1.	Children's age	.45	3.25**	.20	.20	.14	.97	.06	.06
	Non-verbal IQ	.11	.74			.16	1.03		
	Mother's education	.11	.78			.14	.91		
2.	Print mediation	.09	.64	.21	.01	.27	1.85†	.13	.07

Note: N=49. † $p < .10$, *$p < .05$; **$p < .01$; ***$p < .001$

Relations of commentary mediation to literacy skills in three groups

Table 16 presents correlations of commentary mediation with Chinese word reading, word writing across three groups of Hong Kong K3, Beijing K3 and Beijing P1 children. It shows that in Hong Kong K3 children, only process comments among all these five categories were significantly correlated with Chinese character reading and writing. In Beijing K3 children, only this process variable was significantly associated with Chinese character reading. None of the commentary mediation categories was correlated with any of the character reading, or writing measures in Beijing P1 children.

Table 16.
Correlations of Commentary Mediation with Chinese Word Recognition, Word Writing, Vocabulary, Literate Mediation and Print Mediation across Three Groups in Study 2.

Variables	Word recognition	Word writing	Word recognition	Word writing	Word recognition	Word writing
	Hong Kong K3 (N=63)		Beijing K3 (N=43)		Beijing P1 (N=49)	
1. Positive	-.02	-.09	.06	-.03	-.20	.01
2. Negative	-.15	-.13	.13	-.02	.01	-.16
3. Process	.33**	.30*	.41**	.10	-.10	-.18
4. Outcome	.06	-.12	.03	-.10	-.06	-.01
5. Person	.06	.12	.02	.22	-.15	-.07

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

Given that the correlation results showed that only the process comment variable was associated with literacy skills in kindergarten children, I only included process comments in a final set of hierarchical regression equations to examine to what extent this process response variable would explain literacy skills with background information and cognitive skills controlled in both Hong Kong K3 children and Beijing K3 children. As shown in Table 17 for Hong Kong K3 children, with children's age, nonverbal reasoning, and maternal education statistically controlled, process comments explained 9% unique variance in explaining Chinese character reading, ΔF (1, 51) = 5.77, $p < .05$, and 7% unique variance in explaining Chinese character writing, ΔF (1, 51) = 4.50 ; $p < .05$. Even with metalinguistic awareness including phonological awareness, morphological awareness, and orthographic awareness further controlled, process comments explained 6% unique variance for Chinese reading, ΔF (1, 48) 4.51, $p < .05$, and 4% variance for Chinese writing, ΔF (1, 48) = 2.57, $p = .12$. In the final equation models, process was significant in its associations with Chinese reading but not Chinese writing.

For Beijing K3 children, as shown in Table 18, with the same step 1 variables controlled, process explained 7% unique variance of Chinese character reading, ΔF (1, 38) = 4.20, $p < .05$. With the same metalinguistic awareness further controlled, process explained 5% of the variance, ΔF (1, 31) = 3.34, $p = .08$ in Chinese word reading. However, it was not a unique correlate in the final regression model.

An overall summary of these correlational and regression analyses results (i.e., between the maternal mediation measures--including literate mediation, print mediation and commentary mediation-- and metalinguistic awareness, and Chinese reading and writing skills) are summarized in Table 19.

Table 17.
Hierarchical Regression Explaining Chinese Word Recognition, and Chinese Word Writing from Commentary Mediation of Process, Outcome and Person with Children's Age, Non-Verbal IQ, and Mother's Education Controlled among Hong Kong K3 Children in Study 2.

		Chinese word recognition				Chinese word writing			
Step	Variables	Beta	t	R^2	ΔR^2	Beta	t	R^2	ΔR^2
1.	Children's age	.18	1.30	.14	.14	.01	.05	.17	.17
	Non-verbal IQ	.18	1.29			.34	2.46*		
	Mother's education	.09	.74			.10	.79		
2.	Process	.31	2.40*	.22	.09	.27	2.12*	.24	.07
1.	Children's age	-.01	-.10	.14	.14	-.10	-.69	.17	.17
	Non-verbal IQ	.08	.59			.19	1.39		
	Mother's education	.05	.44			.02	.20		
2.	Phonological awareness	.13	.95	.32	.19	.33	2.38*	.32	.15
	Morphological awareness	-.05	-.42			-.03	.26		
	Orthographic awareness	.44	3.28**			.16	1.19		
3.	Process	.25	2.12*	.38	.06	.20	1.60	.35	.04

Note: N=63. † $p < .10$, *$p < .05$; **$p < .01$; ***$p < .001$

Table 18.
Hierarchical Regression Explaining Chinese Character Recognition, and Chinese Word Writing from Commentary Mediation of Process, Outcome and Person with Children's Age, Non-Verbal IQ, and Mother's Education Controlled among Beijing K3 Children in Study 2.

		Chinese character recognition				Chinese word writing			
Step	Variables	Beta	t	R^2	ΔR^2	Beta	t	R^2	ΔR^2
1.	Children's age	.26	1.88†	.30	.30	.08	.50	.10	.10
	Non-verbal IQ	.25	1.92†			.23	1.50		
	Mother's education	.24	1.89†			.13	.86		
2.	Process	.28	2.05*	.37	.07	.04	.26	.10	.00
1.	Children's age	.14	.96	.29	.29	-.07	-.37	.07	.07
	Non-verbal IQ	.17	1.19			.15	.87		
	Mother's education	.15	1.20			.05	.30		
2.	Phonological awareness	.10	.62	.47	.18	.00	.02	.22	.15
	Morphological awareness	.17	1.11			-.16	-.82		
	Orthographic awareness	.29	1.80†			.48	2.32*		
3.	Process	.25	1.83†	.52	.05	-.03	-.17	.22	.00

Note: N=43. † $p < .10$, *$p < .05$; **$p < .01$; ***$p < .001$

Table 19.
Summary of Correlation and Regression Results in Study 2.

	Literate mediation			Print mediation			Process mediation		
	HKK3	BJK3	BJP1	HKK3	BJK3	BJP1	HKK3	BJK3	BJP1
Chinese reading	#	#	n.s.	*	*	n.s.	#	*	n.s.
Chinese writing	*	#	n.s.	n.s.	*	*	*	n.s.	n.s.

Note: * indicates a significant correlation with the outcome variable; # indicates that the mediation variable was a unique predictor in the equation, even with general demographics, cognitive skills, and metalinguistic awareness controlled (in addition to being significantly correlated with the outcome variable); "n.s." indicates a non-significant correlation.

Discussion

In Study 2, we demonstrated the following findings. First, mothers of kindergarten children from both Hong Kong and Beijing tended to use lower level literate mediation strategies, such as stroke, component segmentation, and lower level print mediation, such as hand-holding and copy, whereas mothers of first graders in Beijing tended to use higher level literate mediation strategies, such as character level mediation, and higher level print mediation, such as scaffolding and monitoring. In addition, Hong Kong K3 mothers tended to use more visualization and component segmentation strategies, whereas Beijing K3 mothers tended to use more structure and character level mediation strategies. Moreover, on the print mediation scale we found that mothers relied heavily on the copy strategy across all three groups. Second, for commentary mediation, we found that Beijing K3 mothers used both positive and negative comments fairly equally, but Hong Kong K3 mothers offered more negative than positive responses to their children. Beijing P1 mothers made slightly more positive than negative responses. Third, in examining the relation of literate mediation to metalinguistic awareness and literacy skills, I demonstrated that literate mediation was significantly correlated with Chinese reading and writing in both Hong Kong K3 and Beijing K3 children, and literate mediation explained 11% to 25% unique variance in literacy skills even with maternal education, non-verbal reasoning and metalinguistic skills statistically controlled. However, no association between literate mediation and Chinese character reading and writing was found among Beijing P1 children. In addition, the

results further showed that orthographic awareness partially mediated the relation between literate mediation and Chinese character reading in Hong Kong K3 children, but not among Beijing children. Fourth, a significant, positive association of print mediation to Chinese literacy skills was found in Hong Kong K3 and Beijing K3 children, but not in Beijing P1 children. However, with children's age, non-verbal reasoning and maternal education controlled, significant unique variance in reading (13%) and writing (22%) from print mediation was only found in Beijing K3 children. Fifth, for commentary mediation, only process mediation was found to be significantly uniquely associated with Chinese character reading and writing in Hong Kong K3 children and significantly related to Chinese character reading in Beijing K3 children with children's age, nonverbal reasoning and maternal education statistically controlled. These findings and implications are discussed in more detail in the general discussion.

Chapter Four Study 3

Study 1 and Study 2 demonstrated the importance of maternal mediation of character writing for literacy acquisition in both Hong Kong and Beijing kindergarten children. One striking characteristic of young children at this age learning Chinese literacy skills in Mainland China is the instrument of Pinyin as Cheung (2003) noted. Chinese Pinyin is intensively introduced to children in a relatively short period, typically in kindergarten and before the second term of first grade, but in Hong Kong, there is no such phonological coding system taught (e.g., Cheung & Ng, 2003). Thus, I was particularly interested in whether mothers' facilitation of Pinyin mediation would also promote children's reading and writing skills. Therefore I conducted Study 3 to examine the role of maternal Pinyin mediation for Chinese reading and writing among Beijing K3 children. Beijing P1 children were not included for this study because their Pinyin writing had been fully mastered by this age, so maternal mediation would have yielded only ceiling effects for this group.

Pinyin is composed of onset, rime and tone representations. There are 21 onsets, 35 rimes and 4 lexical tones according to the Chinese Pinyin Schema as shown in the contemporary Chinese dictionary (Lv & Ding, 2005), but the smallest unit of Pinyin is the phoneme. Study 1 and Study 2 had demonstrated that mothers' more analytic and detailed mediational strategies tended to be associated with children's higher performance levels for Chinese character analysis. Using the same principles, I sought to differentiate maternal Pinyin mediation from lower to higher levels, which

I viewed as ranging from more holistic to more analytic strategies. For example, during the Pinyin mediation interaction, some mothers may only holistically utter the whole Pinyin word to the child, some may separate Pinyin into onset and rime, and some others may specifically instruct children on each phoneme. Mothers may also point out the specific lexical tone of the word or indicate the position of the tone. As inspired by the two studies above and the studies of alphabetic script by Aram and Levin (2001, 2004), I developed a Pinyin mediation scale in Study 3. I expected that maternal Pinyin mediation quality would be positively associated with Chinese literacy skills. More importantly, I tested whether maternal mediation of Pinyin writing could uniquely account for literacy skills beyond various other measures of phonological awareness, which have been established to be associated with word reading (e.g., Shu, Peng, & McBride-Chang, 2008).

Method

Participants

The same Beijing K3 children and their mothers who participated in Study 2 were involved in the present study.

Measures

Maternal mediation of Pinyin writing

The mother was asked to help her child to write six words in Pinyin form as best as she could. All of these words were presented to each mother-child pair in a random fixed order using pictures only. To ensure that the mother-child dyad wrote those words I intended for them to write, those pictures were orally labeled to

mothers before they started writing. However these words were not presented in any form of print, either using Chinese characters or Pinyin. These six words were selected to be orally familiar to children as shown in Appendix 4. These six words covered the most commonly used letters. In specific all six vowels (a, o, e, i, u, ü) and twelve of the existing twenty-three initial consonants were included in these selected words. At the same time they were selected to maximize opportunities for cross-word comparisons. For example, a mother could compare 蜻(*qīng*) and 蜓 (*tíng*) by saying that they have the same rime (*ing*) but different onset and lexical tone.

Tone awareness

In this task, the experimenter first said aloud three one-syllable words, and children were asked to select the word with a different tone from the other two. For example, three words, *kuí, bó*, and *bān,*were aurally presented to children, and the child was expected to select the word *bān* which has a different tone from the other two and thus was the "odd one out." A similar task was used by Chen, Anderson, Li, Hao, Wu, and Shu (2004). For each trial, the experimenter repeated the three words in order twice. There were a total of 24 items

Other measures of Chinese character reading, Chinese character writing, syllable deletion, non-verbal reasoning, and maternal education level as described in Study 2 for Beijing K3 children were included for analyses in the present study. I did not include the phoneme deletion task because Beijing K3 children demonstrated a floor effect for it as found in Study 2.

Procedure

The mother-child Pinyin mediation task and tone awareness was carried out at children's homes and the whole Pinyin mediation process, which typically lasted approximately 25 minutes, was videotaped and later coded by two trained coders who were unaware of the study hypotheses.

With the principle that unanalyzed and surface level Pinyin instruction represents a lower level of mediation and analytic and deeper level analysis functions at a higher level mediation, we developed the Pinyin mediation coding schema as shown in Appendix 5. The Pinyin coding principle is similar in some degree to the coding of invented spelling as demonstrated in previous work (e.g., Ouellette & Sénéchal, 2008; Tangel & Blachman, 1992). Because of the unique characteristics of Chinese Pinyin, we coded each Pinyin word on four different dimensions of onset, rime, tone, and integration. Onset was scored as 0 or 1, corresponding to whether or not mothers uttered the onset phoneme. Rime was coded on a 4-point scale (0-3): 0 points were given if the mother did not mention the rime; 1 point was credited if a mother focused on the entire rime but no segments. For example, a mother uttered *ua* for the Pinyin of *guā*. If a mother uttered part of the phoneme in the rime, e.g., a mother uttered *a* in the pinyin of *guā*, 2 points were allotted. Three points were allocated if a mother segmented each phoneme in the rime; for example, a mother pronounced both the *u* and *a* in the Pinyin for *guā*. However, it should be noted that across all of the 12 Pinyin items (six two-character words), the rimes for three Pinyin syllables, i.e., *zi*, *wā* and *bo* were composed of a

single phoneme only. Thus, when a mother mediated the rime of these three segments, I directly scored each based on the single phoneme utterance only (3 points). Tone was coded on a 3-point scale (0-2). Zero, 1, and 2 points were credited for no mediation of tone, retrieving the tone, and both retrieving the tone and indicating the tone position, respectively. An example of tone position indication would be that a mother said to her child that the high-level tone should be marked on *a* rather than *u* of the Pinyin *guā*. Integration was coded in two categories of explanation and comparison. In the integration- explanation category (integration_1 in Appendix 5), no point was given for not uttering the sound of Pinyin, 1 for an utterance of the entire Pinyin sound only, and 2 for an utterance of the onset, rime and tone, each separately, and immediately connecting them together (for example, a mother said *g-u-ā-guā*). In the integrated comparison category, a 0 for no utterance of the Pinyin sound, 1 point for a broad comparison of the target Pinyin sound with another (for example, "listen, *qīng* and *tíng* are different."), and 2 points for a specific comparison of onset, rime or tone (for example, "*qīng* and *tíng* have the same rime, *ing*") were given.

The maximum score of each mediated Pinyin word was 10 points. Across all cases, 23% (10 cases) of the videotapes were double-coded and demonstrated a good inter-rater reliability of intraclass correlation (ICC) =.87.

Results

Table 19 shows the means, standard deviations, range, and reliabilities across all the variables included in Study 3. All the measures were relatively normally

distributed and the internal consistency reliabilities of all variables were above .77.

Table 20.

Means, Standard Deviations, Range, and Reliability for All Variables in Study 3.

Variables	Mean	SD	Range	Cronbach's α
Chinese word reading (100)	27.35	23.87	2 - 95	.99
Chinese word writing (17)	4.58	2.89	0 - 16	.77
Syllable deletion (16)	14.28	2.15	1 - 16	.87
Tone awareness (24)	11.45	6.31	0 - 24	.90
Pinyin mediation (10)	4.82	1.38	2.25 - 7.25	--
Non-verbal IQ (24)	16.05	3.97	6 - 24	.80
Child's age (years)	6.16	.34	5.58 7.41	--
Mother's age (years)	36.98	3.56	31.83 48.50	--
Mother's education (7)	6.19	0.76	4 - 7	--

Note: N = 43.

Correlations among all variables are shown in Table 20. Pinyin mediation was significantly associated with Chinese word reading and tone awareness, but not correlated with Chinese word writing or syllable awareness.

Table 21.
Correlations among All Variables in Study 3.

Variables	1	2	3	4	5	6	7	8	9
1. Chinese word reading	--								
2. Chinese word writing	0.63 ***	--							
3. Syllable deletion	0.31	0.25	--						
4. Tone awareness	0.28	0.42 **	0.32 *	--					
5. Pinyin mediation	0.47 **	0.25	0.18	0.36 *	--				
6. Non-verbal IQ	0.32 *	0.26	0.37 *	0.15	0.22	--			
7. Child's age	0.34 *	0.13	-0.07	0.14	0.11	0.16	--		
8. Mother's age	-0.03	-0.02	-0.30	0.16	0.17	-0.21	0.28	--	
9. Mother's education	0.25	0.15	0.13	0.08	0.17	0.08	-0.01	0.13	--

*Note: *p< .05; **p < .01; ***p < .001*

To examine the extent to which Pinyin mediation would explain Chinese character reading and writing, I conducted hierarchical regression analyses as shown in Tables 21 and 22. With children's age, nonverbal reasoning, and maternal education statically controlled, Pinyin mediation contributed 16% unique variance in explaining Chinese character recognition. Even with syllable deletion and tone awareness further controlled, Pinyin mediation still accounted for 10% unique variance in Chinese character recognition. In the final regression model, children's age, maternal education, and Pinyin mediation ($t = 2.41$, $p<.05$) emerged as significant unique positive correlates. However, Pinyin mediation only explained 5%

and 1% unique variance in Chinese character writing with the same variables controlled. These results suggested that analytic and deeper Pinyin mediation may facilitate very early Chinese reading but not necessarily Chinese writing.

Table 22.

Hierarchical Regression Explaining Chinese Word Reading and Chinese Word Writing from Pinyin Mediation with Mother's Age, Education, Children's Non-Verbal IQ, and Age Controlled in Study 3.

		Chinese word reading				Chinese word writing			
Step	Variables	Beta	T	R^2	ΔR^2	Beta	t	R^2	ΔR^2
1.	Non-verbal IQ	.03	.19	.31	.31	.10	.55	.10	.10
	Child's age	.35	2.50*			.14	.84		
	Mother's age	-.24	-1.61			-.10	-.57		
	Mother's education	.30	2.21*			.17	1.02		
2.	Pinyin mediation	.45	3.13**	.47	.16	.25	1.47	.15	.05

Note: N=43. *$p < .05$; **$p < .01$; ***$p < .001$

Table 23.

Hierarchical Regression Explaining Chinese Word Reading and Chinese Word Writing from Pinyin Mediation with Mother's Age, Education, Children's Non-Verbal IQ, Age, Syllable Deletion and Tone Awareness Controlled in Study 3.

		Chinese word reading				Chinese word writing			
Step	Variables	Beta	t	R^2	ΔR^2	Beta	t	R^2	ΔR^2
1.	Non-verbal IQ	-.03	-.18	.40	.40	.04	.22	.27	.27
	Child's age	.35	2.42*			.12	.69		
	Mother's age	-.20	-1.34			-.12	-.71		
	Mother's education	.29	2.09*			.16	1.04		
	Syllable deletion	.16	1.03			.07	.41		
	Tone awareness	.10	.69			.36	2.12*		
2.	Pinyin mediation	.37	2.41*	.50	.10	.12	.67	.28	.01

Note: *$p < .05$; **$p < .01$; ***$p < .001$

Discussion

Study 3 demonstrated the importance of maternal Pinyin mediation for early Chinese character recognition. The unique association between Pinyin mediation and Chinese reading beyond traditional tasks of phonological awareness was particularly salient. These results suggest that analytically-focused Pinyin mediation may be important for cultivating young Chinese children's literacy skills.

Considering that these children had little, if any, experience with Pinyin or literacy in general, ways in which Pinyin mediation relates to children's reading skill may be attributable to the fact that there are always direct correspondences between Pinyin and Chinese characters in children's readings. When mother and child are together reading books, the direct association between pinyin and Chinese character representations may be implicitly internalized by children. Another reason may be because Pinyin strongly clarifies the phonological composition of the given word or character and phonological information was found to be important to facilitate early reading across languages (Perfetti, & Tan, 1998; Perfetti, Zhang, & Berent, 1992). The Pinyin system explicitly focuses attention on onsets, rimes, and tonal information and may facilitate children to apply this system to actively recognize Chinese characters. Though I did not find correlations between Pinyin mediation and syllable deletion, the results showed a positive correlation between Pinyin mediation and tone awareness. As the Pinyin mediation scale highlights detailed phoneme and analytic mediation, further studies may seek new, appropriate ways to measure phoneme awareness and further examine the relations among Pinyin mediation, phonological

awareness and Chinese literacy skills.

However, the results did not show an association between Pinyin mediation and Chinese writing. One reason may be because Chinese writing requires an explicit focus on strokes and components within each character and it requires concrete practice (Tan, et al., 2005), but Pinyin mediation focuses on onset-rime/phoneme segmentation. These two involve very different processes. Another reason may be that our measure of writing using word dictation may have been too difficult for these young children. Over one third of the children could only produce 3 or fewer Chinese characters out of 17, indicating a skewness problem for these children. A relatively normal distribution was obtained for our reading measure. Thus, literacy attainment may be better reflected as reading performance than writing for these young Mainland Chinese children.

Chapter Five General Discussion

This research explored maternal mediation of writing in two prominent Chinese societies of Hong Kong and Beijing, and further investigated the associations of maternal mediation of writing and cognitive/metalinguistic awareness and literacy skills. The work consisted of three studies. In Study 1, I modified and tested two scales of literate mediation and printed mediation developed by Aram and Levin (2001) in Hebrew. In Study 2, I further refined the two scales and extracted a commentary mediation measure in the mother-child dyad interactions. I compared these three maternal mediation measures across mothers in both Beijing and Hong Kong. In addition, I examined these mediation measures in relation to Chinese reading and writing skill and other previously established cognitive correlates of word reading in Chinese. Finally, in Study 3, I extended this work to explore maternal mediation in relation to Pinyin writing, and the relation of maternal Pinyin mediation to Chinese reading and writing acquisition as well.

Thus, in this dissertation, I demonstrated the following findings more specifically: In Study 1, the ordinal literate mediation and print mediation scales were developed in Hong Kong Chinese children only. Strong grade-related differences were demonstrated, with mothers of second year kindergarten (K2) children demonstrating more memorization, such as copying, and controlling strategies than did mothers of first graders (P1); mothers of third year kindergarten students showed a middle-level of autonomy across scales. In Study 2, I compared the nature of maternal mediation of writing across Beijing and Hong Kong among K3 children. Because Hong Kong

children begin learning Chinese formally in school earlier than do children from Beijing, I also included a group of P1 Beijing mother-child dyads for comparison. Overall, results of Study 2 demonstrated that literate and print mediation levels generally did not differ between Hong Kong and Beijing kindergarteners' mothers, but these levels tended to be higher in first graders than in kindergarteners. Interestingly, overall, Hong Kong mothers tended to respond more negatively than positively to their children, but Beijing mothers similarly applied positive and negative responses. In general, Beijing mothers responded more positively than Hong Kong mothers did. In addition, in Study 2, I found that literate mediation was significantly associated with Chinese word reading, writing, visual skills, orthographic awareness, and morphological awareness, but not phonological awareness, in Hong Kong K3 children, and orthographic awareness functioned as a partial mediator between literate mediation and Chinese word reading for this group. In contrast, among K3 Beijing kindergartners, literate mediation was only correlated with Chinese reading, writing, and syllable deletion. Interestingly, in Beijing first graders, literate mediation was only associated with visual skills. Moreover in Study 2, I found that print mediation was significantly correlated with Chinese word reading and writing, and literate mediation in both Hong Kong and Beijing kindergartners, but among Beijing first graders, print mediation was only significantly associated with Chinese writing and orthographic awareness. Furthermore, in Study 2, results suggested that process commentary was sometimes uniquely associated with Chinese literacy skills even with demographic information and metalinguistic awareness controlled. In Study 3,

another maternal mediation scale for Pinyin writing was developed, and maternal Pinyin mediation was found to be important for children's reading skills. These findings underscore the significance of maternal mediation for writing in children's literacy development in Chinese.

These findings are discussed in more detail in the following eight sections. First, I discuss the development and validation of literate mediation and print mediation scales for Chinese mother-child dyads. Second, I compare the nature of maternal writing mediation in three measures of literate mediation, print mediation, and commentary mediation across Hong Kong and Beijing. Third, the relations among literate mediation, metalinguistic awareness and literacy skills across two cultures are discussed. Fourth, I interpret the relations of print mediation to Chinese reading and writing skills across Hong Kong and Beijing. Fifth, I consider the associations between commentary mediation and literacy skills across Hong Kong and Beijing. Sixth, the extended maternal Pinyin mediation scale developed only in Beijing K3 children and its relations to literacy skills are explained. Seventh, I discuss the present results of maternal mediation of writing in Chinese compared to previous findings in alphabetic scripts. Lastly, limitations of the present research are identified and contributions of this dissertation are highlighted.

Development and validation of literate and print mediation scales for Chinese mother-child dyads

Study 1 demonstrated that Hong Kong mothers' selection of literate mediation strategies explained roughly 8% to 11% unique variance in Chinese word reading

with maternal education, children's nonverbal reasoning and age controlled. Study 2 further suggested that literate mediation contributed between 11% to 15% unique variance in word reading in kindergarten children and 25% unique variance in word writing in Beijing K3 children, with cognitive and metalinguistic awareness statistically controlled. I consider the findings and implications of each strategy in maternal mediation below.

Across samples, the stroke strategy, in which mothers focus on the smallest unit of Chinese characters (Shu, Chen, Anderson, Wu, & Xuan, 2003) was prevalent. The number of stroke-patterns is around 600 in Chinese (Shanghai Jiaotong University, 1988). Given the importance and prevalence of these patterns, this finding that mothers tend to focus on strokes may be partly attributable to the fact that, traditionally, Chinese teachers and parents have emphasized the role of rote memorization in learning to read and write in Chinese (e.g., Packard et al., 2006). It also may be that mothers of younger children who are likely to read and write fewer words tend to respond on a lower level of mediation, or scaffolding. For instance, young children might need their mothers to illustrate more concrete steps, involving, for example, stroke order and style. However, this stroke strategy was found to be negatively related to Chinese word reading skills in Study 1. This result may highlight a call for more attention from parents, teachers, and scholars to the fact that the role of rote memorization for learning Chinese character in young children is questionable (Wu, Li, & Anderson, 1999)

In addition, the visualization strategy, in which mothers imagine abstract

characters as concrete objects or pictures, was used relatively rarely by mothers as found in both Studies 1 and 2. This may be due to the fact that modern Chinese characters are more and more difficult to visualize or that visualizing a character or a part of the character is often difficult to link to a meaning or shape of the character, except for a small percentage of simple characters (10%) (Hoosain, 1991). Moreover, the visualization strategy tended to be used primarily with the youngest children, indicating that maybe the youngest children are more in need of mnemonic devices to help with their writing development.

The segmentation strategy was a relatively often-used strategy in the mother-child collaborative writing across studies. As found in Study 1, Hong Kong mothers tended make use of this strategy with similar frequency across K2, K3, and P1. Similarly, in Study 2, Beijing mothers also fairly consistently applied the segmentation strategy across K3 and P1 children. Given that 90% of modern Chinese characters are composed of radicals (Hoosain, 1991), mothers may be sensitive to this information and easily communicate it to children. The segmentation strategy seems to be relatively unrelated to word reading as shown in the correlational results of Study 1, which may be because in this strategy mothers only point out the components but not any of their forms or functions, as found in previous research (e.g., Ho, Yau, & Au, 2003). In that study (Ho et al., 2003), children developed segmentation ability earlier than radical functional knowledge. However, segmentation is probably important for children's acquisition of Chinese characters, e.g., understanding the functions of phonetic or semantic radicals (e.g., Ho, Chan, Lee, Tsang, & Luan, 2004).

The next strategy, the structure strategy, was newly separated in Study 2. The results from this study, i.e., that mothers used a lot of it during the maternal mediation process, confirmed the necessity of including it independently in the literate mediation scale. In contrast to the English orthography, in which the letters for a given word are arrayed in a line from left to right without exception, for Chinese characters, different components could be arrayed in various ways. For example, a character could be constructed as a left-right structure, such as 她 (she), or in a top-down way, such as 花 (flower), or it could be composed within a half-circle structure, such as 病 (sick), or a full-circle structure, such as 国 (country). The structure strategy captures mothers' attention to these internal compositional elements of a character. For example, as observed in Study 2, in writing 学, a mother pointed out that this was a top-down structured character in that the top part was 𠫓, and the bottom part was 子, and asked her child to remember that 𠫓 was always on the top in writing any character. Thus structure mediation may be particularly related to children's literacy skills. For example, Chan and Nunes (2001) noted that there were no differences for children's acquisition of intracharacter knowledge even with varied teaching pedagogy. Tsai (2001) also described children as creating an internal mental structure of Chinese characters with their accumulated knowledge of the written script.

The phonetic radical function mediation was found to be the least used strategy among these seven proposed strategies. Such a seldom-used phonetic strategy sharply contrasts with what is known about alphabetic script writing mediation, in which mothers largely use phonological cues (e.g., retrieving a phoneme) in helping children

to write words (e.g., Aram & Levin, 2001; 2004). In addition, the rare use of phonetic information in Chinese writing also differs somewhat from previous findings highlighting the importance of phonological sensitivity in Chinese reading (e.g., Chan & Nunes, 1998; Chen & Allport, 1995; Ho & Bryant; 1997a). One reason for the lack of use of phonological information in Chinese writing mediation may be that phonetic radicals in Chinese characters are relatively unreliable. As Zhu (1987) reported, the accuracy of the pronunciation of a compound character from its phonetic radical is about 39%, and it drops to 19% if the frequency of character usage is taken into consideration. Still, Ho and Bryant (1997) proposed that orthographic-phonological rules are important for Chinese reading, suggesting that even beginning readers were aware of the phonetic radical cues for pronunciation. Chan and Nunes (1998) further suggested that nine-year-olds come systematically to understand the phonetic radical as a clue for pronunciation. In addition, some studies on adults have shown that phonetic radicals were utilized by adults readers in character recognition (e.g., Chen & Allport, 1995). However, these studies largely focused on children and adults who were substantially older than those in the present study. In addition, given that previous work focused mostly on word recognition, and the present study was focused on mediation of writing per se, perhaps Chinese writing and reading make use of somewhat different underlying mechanisms, such that in writing there may be a selective attentional bias toward the semantic radical but not the phonetic radical, whereas in reading there is a selective attentional bias toward the phonetic radical. This interesting issue may be further explored in future studies.

The semantic function strategy, which was refined from the morpheme strategy in Study 1, was found to be similarly used among Beijing kindergarten and first grade children. The semantic function strategy focuses on pointing out the meaning link between a semantic radical and the character. As there are only 200 semantic radicals in modern Chinese (Hoosain, 1991), but approximately 3,500 frequently used Chinese characters (more than 80,000 Chinese characters in total) (Zhong hua zi hai, 1994), mastering of the meaning associations of semantic radicals should be helpful for children's literacy development in the long term.

The final character level mediation strategy, identified more specifically from Study 1's morpheme strategy, was also similarly used among Beijing K3 and P1 children. Inter-character application and comparison requires that children have some prior knowledge of character writing and also requires more advanced cognitive processing than lower level mediation. Study 1 found strong positive associations between this morpheme strategy and children's word reading, suggesting that the more a mother uses an analytic strategy, the better her child's reading skills, even among young children. The strong link between morphological awareness and Chinese literacy, especially Chinese reading, has been widely recognized (e.g., McBride, et al., 2003; Wang, Cheng, & Chen, 2006).

In addition, the ordinal literate mediation and print mediation scales using mothers' typical mediation strategies were further examined and tested by correlating them with Chinese word reading, especially Chinese word writing cross- culturally. Their associations were positive and moderate to high in the kindergarten samples,

suggesting a reasonable order of these scales.

Moreover, the ordinal literate mediation in seven strategies was developed in principle as treating rote memorization or visualization as lower levels, intra-character analytic strategies at the middle level, and an inter-character level application and comparison as falling towards the highest level mediation. This idea is largely in line with work by Ho, Chan, Lee, Tsang, and Luan (2004), showing that children's reading acquisition developed in three stages, i.e., the logographic stage, the "cipher" stage, and the orthographic stage. The logographic stage refers to the rote memorization of new characters and incorporation of visual skills that may be important in discriminating and memorizing different shapes of characters at this stage. At the "cipher" stage, children gradually discover the positional and functional regularities of radicals in Chinese characters. When children proceed to the orthographic stage, character parts or whole Chinese characters are processed automatically as whole units and children's attention may switch to inter-character or word level. Similar ideas have also been documented in the study of Ho, Yau, and Au (2003). In addition, the analytic approach, rather than rote memorization, in learning Chinese characters is advocated in some other studies focusing on Chinese literacy development (e.g., Chan & Nunes, 1998; Chan & Wang, 2003).

However, the positive associations of literate mediation and print mediation with Chinese word reading and writing were not found in Beijing P1 children. This may not be all that surprising given the one-year intensive school training of first graders in Beijing. P1 children were in the end of the second semester when I collected these

data. For kindergarteners, especially in Beijing, the majority of all literacy input received were from their parents, particularly mothers, because Beijing kindergartens are play-oriented, at least as dictated by governmental policies. Thus, the ways in which mothers teach their children matter a lot for children's own literacy development. However, the situation for P1 children is quite different. Though mothers may still be helping their children in reading and writing at home, the majority of children's literacy input comes from school teachers for this grade level. Thus, any possible effects of maternal mediation on literacy skills may have been counter-balanced by intensive school training. For example, it is possible that a particular mother of a P1 student often focuses on lower level mediation, such as telling her child to write characters stroke by stroke. In this instance, based on the results of Study 1, it might be hypothesized that the child's literacy skills would be low. However, school training would likely improve the child's reading and writing skills. Thus, the mother's efforts might emerge as relatively minor among P1 children. Although Hong Kong kindergartners begin formal learning of Chinese reading and writing as early as the first semester of K1, they learn it in a more casual way and are only expected to learn approximately 150 characters during the three-year schooling period (Cheung & Ng, 2003). However, Beijing P1 children are required to learn approximately 450 characters within one year (Standard text book, 2006). Perhaps this P1 formal educational push may at least partly explain why the literate and print mediation scales showed few associations among primary school first graders. These P1 results may potentially have some educational implications for parents practically.

With increases in children's age and grade level, as children gradually acquire more and more Chinese characters and words, maternal mediation for simple word writing itself may no longer be clearly beneficial to children. Mothers may accordingly shift on to "higher level" mediation, including guiding children on sentence and story acquisition and fostering children's syntax, imagination, and creativity skills.

To summarize, although the developed literate mediation and print mediation scales may not have been particularly applicable to Beijing first graders, however, they were apparently relatively relevant and useful for understanding literacy skills among kindergarteners across Hong Kong and Beijing.

Comparisons of the nature of maternal mediation across Hong Kong and Beijing

One important aspect of Study 2 was a comparison across Beijing and Hong Kong mothers in their mediation strategies. To begin with, I tested two grade levels in Beijing just because of the clear differences here in formal teaching. As hypothesized, mothers of P1 children mediated their children's writing at a higher level than did mothers of K3 children. This finding held across both the literate mediation and print mediation scales. Given that P1 children's independent reading and writing skills were better than were those of the K3 children, the results were in line with the expectation that mothers of P1 children would correspondingly mediate at a higher level (i.e., in a more analytic and advanced way) in literate mediation and allow more autonomy in the overall printing of characters (i.e., encourage children to write on their own).

However, the expected cultural differences of literate mediation and print mediation across Beijing and Hong Kong were not found. Initially, we had speculated

that Hong Kong K3 children would better perform on literacy skills than Beijing K3 children due to the kindergarten educational policy. Beijing K3 children's relative high literacy skill may be because of the practical issue that most parents surreptitiously teach their children at home (Li & Rao, 2000).

Interestingly, Hong Kong mothers more frequently used visualization and component strategies than did the Beijing mothers as expected, whereas Beijing mothers demonstrated more structure and character mediation than did Hong Kong mothers. I put forward two reasons for these results. First, maternal mediation strategies may be influenced by government education guidelines. Hong Kong pre-school education policy encourages explicit teaching of Chinese reading and writing, whereas Beijing pre-school education guidelines discourage explicit or detailed ways of teaching Chinese reading and writing. Thus, Hong Kong mothers may emphasize the mastering of the production of characters, whereas Beijing mothers may use whole-character level or story-telling ways to help children understand the Chinese words. Second, an increased focus on visualization and components within characters on the part of Hong Kong mothers may be attributable to the fact that traditional Chinese script is used in Hong Kong and simplified Chinese script is used in Beijing.

The simplified script used in Mainland China was first simplified from traditional script in 1955. Peng (1986) addressed eight principles in the simplification process, including: 1) borrowing simple homophones for traditional characters; 2) using existing common and simple variant forms; 3) incorporating "grass-style" characters

used in cursive writing; 4) modifing the ideas conveyed by the characters; 5) replacing part of the character with a simpler phonological component; 6) adopting only a part of the regular character; 7) cutting down the repeated elements or simplifying them; and 8) replacing a number of different complex components with one simplified form. Thus, basically compared to traditional script, simplified script has fewer visual cues and less complex components. However, the linguistic structures of the Chinese characters remained the same following this simplification process.

In the maternal mediation interaction, Hong Kong mothers, who use traditional script, may be more easily primed to use these strategies. For example, the left bottom part of 馬 (horse) in traditional script could potentially be visualized as representing four hooves, but this is not the case for the simplified script of the same character 马 (horse). Perhaps this is another reason why Hong Kong mothers' mediation levels tended to be low. In contrast, the clear structures in simplified Chinese have remained. Chan and Wang (2003) showed that children aged five to nine from Beijing and Hong Kong were equally competent in detecting semantic and phonetic functional units in four-choice selection tasks. In the natural word writing context in the present research, compared to Hong Kong mothers, Beijing mothers may have had available fewer visual or component cues to help their children. However, the character structure strategy might have been more prominent in simplified script. Maybe that is one reason that Beijing mothers used the structure strategy more often than Hong Kong mothers as found in Study 2.

In addition, Beijing mothers used more character-level mediation compared to Hong Kong mothers. Chinese words are rich in lexical-compounding and visually/phonetically/semantically similar ones. These may involve such processes as sensitivity to homophones and homographs, awareness of reverse-morpheme-order words and discrimination of visually or phonetically similar words.For example, a mother may point out that a homophone 恐 (sounding like kong3 in Mandarin) in 恐龙 (dinosaur) and 孔 (also with the sound of kong3 in Mandarin) in 孔雀 (peacock) are pronounced the same but written differently. Or a mother may discriminate two visually similar characters for her child, e.g., 大 (big) and 太 (very) differ in one stroke only. Study 2 documented more such comparisons in Beijing mothers than in Hong Kong mothers. These documented different amounts of morpheme level mediation partly explain the striking results in Study 2 that Beijing children's independent morphological construction awareness was much better than was Hong Kong children's.

The results of commentary mediation were consistent with my hypotheses. In Hong Kong, mothers responded more negatively than positively, which is in line with previous studies demonstrating that Chinese parents tended to respond to their children more negatively (Ng, Pomerantz, & Lam, 2007). However, in Beijing mothers of the same age responded equally positively and negatively, perhaps in part because nowadays each child is the "precious" single one of the family especially due to the one-child policy, and parents are not willing to criticize them excessively. Findings were also in line with those of Berndt et al. (1993), in which Beijing parents

were rated as "warmer" than were Hong Kong parents. Overall, mothers tended to give more feedback to kindergartners than to first graders, perhaps largely because first graders made fewer mistakes in writing so there was less instruction to be given.

Literate mediation, metalinguistic awareness and literacy skills across Hong Kong and Beijing

A particularly interesting aspect of Study 2 was the inclusion of various metalinguistic skills in addition to the mediation scales across cultures. Given that the literate mediation scale was not associated with metalinguistic awareness and literacy skills in Beijing P1 children, the discussion below primarily focuses on kindergarten children across Hong Kong and Beijing.

Study 2 showed that the literate mediation scale was associated with Chinese word reading and writing in both Hong Kong and Beijing, but the associations were even stronger and more consistent across reading and writing in Beijing. Results in Study 1, suggesting that literate mediation may promote reading and writing skills in kindergarten children, are strengthened by the findings in Study 2 that the literate mediation scale was uniquely associated with word reading and word writing (only in Beijing) even with all demographic information and cognitive and metalinguistic skills statistically controlled across Hong Kong and Beijing. Although our data were correlational only, the positive relations of maternal mediation strategies with both reading and writing suggest that higher level or more analytical mediation may facilitate children's reading and writing while lower rote memorization techniques may be less helpful. Indeed, greater attention to Chinese writing including exploiting

the form and function of Chinese characters and word level comparison should be given and advocated (e.g., Packard et al., 2006).

However, it should be noted that although the results suggested that the higher the level at which the mother mediated, the better a child's literacy skills were, I do not mean to suggest that the highest level mediation is always the best for a given child. As discussed earlier, children learn best if an older partner helps within the "zone of proximal development." Though the "zone of proximal development" is abstract for a specific child, mothers should mediate at a level that is optimal for children. Within this range, it may benefit children more when mothers try to mediate using analytic strategies to the extent that that is possible.

Meanwhile, the relations between literate mediation and literacy skills are likely to be bidirectional. As mothers are sensitive to children's individual literacy levels (e.g., Aram, 2007), they may mediate at lower levels for less skilled children, but on higher levels for more literacy-savvy children.

In general, the Chinese word writing measure was less strongly associated with the literate mediation scale than was Chinese word reading among both Hong Kong and Beijing K3 children. Especially in Hong Kong K3 children, literate mediation was not a significant predictor of word writing, once demographics and cognitive/metalinguistic awareness measures were controlled. It may be that children's word writing ability is relatively limited at this age, given that the present work evidenced smaller variability of word writing than word reading. Relatively traditional Chinese may be even more difficult for children in Hong Kong than is

simplified Chinese in Beijing to write. In future studies, it may be interesting to follow up these children and test their writing performance. It is possible that early mother-child writing mediation promotes subsequent writing development. However, at this kindergarten age, it may be that word reading better reflects children's literacy skills.

Meta-linguistic awareness explained 19% and 13% unique variance for Chinese word reading and writing, respectively, in Hong Kong K3 children and 22% and 13% unique variance for word reading and word writing, respectively, in Beijing K3 children, with children's nonverbal reasoning, visual skills, and maternal education level statistically controlled. Orthographic awareness consistently emerged as a significant predictor for all literacy skills, except in the regression equation predicting word writing among Hong Kong K3 children. Because it taps children's sensitivity to internal character structure, orthographic awareness is particularly important for children's literacy development, as demonstrated in previous studies (e.g., Huang & Hanley, 1995; Shu & Anderson, 1997). Although morphological awareness and phonological awareness were significantly related to word reading and writing in zero-order correlational analyses, they were no longer associated with word reading in the comprehensive regression model. It is interesting that among Hong Kong K3 children, phonological awareness appeared to be a unique correlate of Chinese word writing. This result is in line with findings from Tong et al. (in press) in young Hong Kong children, and perhaps it is attributed to the many Chinese words with similar pronunciations (e.g., Chow, McBride-Chang, Cheung, & Chow, 2008; Shu, Chen,

Anderson, Wu, & Xuan, 2003). Identifying and mapping syllables with print may require clear phonological awareness.

Relations of literate mediation to metalinguistic skills

Literate mediation was found to be correlated with visual skills and orthographic awareness, but not associated with phonological awareness and morphological awareness in Hong Kong K3 children. However, in Beijing K3 children, literate mediation was found to be associated with phonological awareness measures (syllable deletion) only.

In Study 2, visual skills were measured using the visual spatial relationship subtest, and such visual skills make use of visual information not related to print. Effective literate mediation adopts an analytic strategy in teaching writing; it usually involves encouraging children to write words on their own. For example, mothers may discriminate two similarly shaped character 兔 (rabbit) and 免 (free). These kinds of mediation may prompt children to notice specific visual orientations and spatial relations, thus enhancing children's visual sensation and skills, as showed by McBride-Chang and Zhong (2003), who demonstrated that Chinese word recognition was longitudinally associated with visual skills development. In addition, this association is likely a bidirectional one, with visual skills and Chinese print recognition facilitating one another.

The correlation between literate mediation and orthographic awareness in Hong Kong children was consistent with my hypothesis, because higher level literate mediation makes use of radical forms and functions, which are essentially the "rules"

of orthographic knowledge. It was found that Hong Kong Chinese second graders relied particularly heavily on orthographic information even in reading English (Wang, & Geva, 2003), indicating the close association between orthographic knowledge and literacy skills.

That virtually no association between literate mediation and phonological awareness was demonstrated in the Hong Kong sample is not surprising. Because Hong Kong adopts a "look and say" method of teaching method, parents and children are likely to pay more attention to visual and orthographic information and less to phonological coding aspects, especially given that the phonetic information of Chinese characters is not particularly reliable (Zhou, 1980).

Interestingly, the relations of literate mediation to metalinguistic skills in Beijing K3 children were quite different from those found for the Hong Kong students. There, effective literate mediation was not related to either visual skills or orthographic awareness. Though there was virtually no instruction from mothers making use of the phonetic strategy, literate mediation was found to be significantly associated with phonological awareness among Beijing K3 children. Perhaps this is because, in Beijing, phonological coding is an integral part of the literacy instruction system, and Mainland children, often from a very young age, have some contact and experience with Pinyin and phonological coding knowledge (e.g., Cheung, 2003). This knowledge, in turn, may facilitate them to become relatively sensitive to and make use of phonological information during the maternal mediation process. For example, the homophone explanation and comparison, including tone discrimination in the

character mediation strategy, may be an effective literate mediation strategy that facilitates phonological awareness. This result was partly consistent with the findings of Study 3, that Pinyin practice was strongly associated with phonological awareness and literacy skills. If children in Beijing are very attentive to phonological information, they may pay relatively little attention to other sources of information, such as orthographic or morphological information, thus minimizing the relation between literate mediation and orthographic and morphological awareness. However, more studies are necessary for making a solid claim of the relation between literate mediation and metalingustic awareness cross- culturally.

The results that morphological awareness appeared to have no association with literate mediation across Hong Kong and Beijing were disappointing. If we look back at the nature of maternal mediation strategies, there was actually a substantial amount of morpheme (character) level mediation. I speculate that there were at least two reasons for these results. First, maybe children's morphological awareness development is not sensitive to this kind of informal maternal mediation. Shu, Peng, and McBride-Chang (2008) examined K1, K2, K3 and P1 children in Beijing on various phonological tasks and found syllable and rime awareness increased gradually and steadily with age, and were relatively uninfluenced by literacy instruction. Given that, in Chinese, one syllable corresponds to one character, and usually to one morpheme, it might be possible that morphological awareness is also less influenced by instruction. Thus, this natural mediation of morpheme components may be not associated with morphological awareness. A second reason for a low association is

that in the present studies morphological awareness was represented only by the measure of morpheme production. Maybe more aspects of morphological awareness should be tapped in future work. Though I included the ortho-semantic measure in an attempt to capture children's sub-lexical level morpheme awareness, the task seemed too difficult and unreliable for K3 children. In future studies, maybe an easier version of the ortho-semantic measure and other morphological measures, such as the morpheme identification task (McBride-Chang et al., 2005) should be developed and tested.

Mediation effect

To summarize results as discussed above, the present results suggested that for Hong Kong K3 children, literate mediation was associated with orthographic awareness, which was further correlated with children's independent literacy skills, whereas for Beijing K3 children, literate mediation was related to phonological awareness and phonological awareness was also related to literacy skills, but the strongest predictor of literacy skills was orthographic awareness. In addition, results further showed that orthographic awareness partially mediated the relation between literate mediation and reading skills in Hong Kong K3 children, but neither phonological awareness nor orthographic awareness appeared to be a mediator between literate mediation and literacy skills in Beijing K3 children. These results suggested that maternal literate mediation may both directly and indirectly contribute to children's independent literacy acquisition.

With mothers' help in scaffolding their writing, children learn to deconstruct

characters into different components, recompose different components into characters, and then transfer this knowledge across different words. The importance of orthographic awareness for early Chinese reading and writing skills has been noted in a number of previous studies (Li, Peng, & Shu, 2006; Packard et al., 2006; Shu & Anderson, 1997). Apart from orthographic awareness as a mediator, future studies may further explore other possible mediators to explain the mechanism of the association between literate mediation and literacy skills.

In addition to proposed indirect mediation mechanisms, effective literate mediation may have a direct association with Chinese reading and writing development. Mothers are likely to facilitate both learning and memory for Chinese words. For example, one particular mother employed simultaneously the component segmentation and semantic radical functional explanation strategies in order to explain 蜜 (honey) in 蜜蜂 (bee) by saying, "An *insect* (虫) who is collecting *honey* (蜜) with her *heart* (心), stores it at *home* (宀), and seals it with a *cover* (丿)." The way of making all components (虫, 心, 宀, 丿) of the character 蜜 (honey) into a story largely facilitates the child's memorization of the character and ensures its easier retrieval and application in the future. In addition, competent literate mediation may support a child to grow into an efficient learner. For example, higher level analytic strategies, e.g., explanations of semantic and phonetic radicals, clarify the characters and words into meaningful units and would likely facilitate children's independent learning of other Chinese characters and words earlier, as compared to a lower level stroke-by-stroke strategy. It should be noted that we assume that the

videotaped mother-child writing scenario in the present studies are representative of many encounters over extended time periods involving mother-child collaborative writing.

Print mediation and literacy skills across Hong Kong and Beijing

Print mediation was found to be uniquely associated with literacy skills only in Beijing K3 children, but not among Beijing P1 children and Hong Kong K3 children in Study 2. The lack of a unique association for the print mediation scale and Chinese word reading in Study 2 was consistent with the results in Study 1, though print mediation scale showed significant zero-order correlation with Chinese word reading in both studies. In general, the more general print mediation scale seemed relatively less important for understanding Chinese literacy acquisition as compared to the literate mediation scale or some of the metalinguistic skills. I speculate on several reasons for this finding below.

First, this finding may reflect the extent to which print mediation, which captures writing autonomy, may be important for cognitive reading and writing skills in Chinese, a controversial issue. Though autonomy is important for social development (e.g., Wang, Pomerantz, & Chen, 2007), it still requires further exploration and explication in its role in literacy development, given that literacy development and social development are two conceptually very different aspects. In addition, we may have found no effect in Hong Kong K3 and Beijing P1 children for this measure perhaps because the variations of children's literacy skills in these two groups were relatively small, at least compared to a wider age range for Study 1, in Study 2.

Second, it may be that the present Chinese print mediation scale is not discriminative enough. If we check back to look at the frequency of each print mediation strategy, the most frequently used level was the whole character copy (PM3) in all three groups from .43 to .82, much higher than for the other strategies. Given that the whole character copy strategy was the dominant one, the variation in typical print mediation was relatively small, suggesting that the present print mediation scale may be not discriminative enough. Maybe in future studies we could try to categorize different types of copying strategies. Other maternal mediation scales may also be developed for capturing different autonomy aspects. However, basically we did not notice one dominant strategy in literate mediation. Except for the two seldom-used strategies of visualization and phonetic radical, the other five strategies were relatively evenly used by mothers.

Commentary mediation and literacy skills across Hong Kong and Beijing

The results of Study 2 highlighted the importance of process comments in kindergarten children across Hong Kong and Beijing. These findings are striking, because even statistically controlling for general background information, the process comments variable was still a significant predictor for Chinese word reading and writing in Hong Kong K3 children and for Chinese character reading in Beijing K3 children, though significant predictive result only remained in explaining word reading for Hong Kong K3 if further controlling for metalinguistic awareness. This finding, underscoring the importance of process comments for literacy skill, is in line with the results of Kamins and Dweck (1999) that process responses promoted

children's self-assessments, affect, and persistence. Process comment responses refer to those remarks that are explicitly related to children's strategies and efforts or those that point out a detailed method by which to finish the task. The process comments in mother-child collaborative writing may not only teach children how to write given specific characters, but may also foster more of a mastery-oriented sense and increase children's overall self-confidence and self-efficiency, thus boosting children's further independent literacy development.

However, in contrast to findings from previous studies (e.g., Kamins & Dweck, 1999; Mueller & Dweck, 1998; Ng, Pomerantz, & Lam , 2007), we did not find any association of positive, negative, outcome, or person comments for Chinese reading and writing skills. There are at least two possible reasons for this. First, in previous studies, these different types of comments were examined in relation to various aspects of social development. However, literacy acquisition may rely more on detailed and specific instructions and responses, but relatively little on emotional and broad responses. Second, the comment frequencies in the mother-child character writing context were relatively low. Each type of comment was made approximately once for one character, and person comments were especially few. This may be another reason why we did not see significant associations between positive, negative, outcome and person comments and literacy skills. This question should be examined in future studies.

Maternal Pinyin mediation and literacy skills in Beijing K3 children

Study 3 examined maternal Pinyin mediation and found that Pinyin mediation

uniquely explained Chinese reading after controlling for maternal education, age, and children's nonverbal reasoning, age, and phonological awareness. However, maternal Pinyin mediation was not associated with Chinese word writing, perhaps partly because children's word writing skills were relatively limited in this preschool age.

I think maternal Pinyin mediation boosts literacy development at least in two ways in Beijing K3 children. One way in which it does so is attributable to the direct association between Pinyin and Chinese character reading. Researchers (Ku & Anderson, 2001; Shu, Anderson, & Zhang, 1995) have noted the importance of incidental learning. In Mainland China, Chinese characters routinely appear together with Pinyin in most pre-school and first grade textbooks and children's readings (Fredlein & Fredlein, 1994; Lee, 1993); thus, it is possible that children's Pinyin knowledge can enhance children's self-learning of new Chinese characters in textbooks or in extracurricular readings. For example, effective Pinyin mediation clarifies the identity of each Pinyin phoneme and these possibly increase children's ability to spell and recognize Pinyin, thus opening an important window on the world of Chinese characters for children at an early age.

Second, Pinyin mediation might strengthen phonological awareness first, and phonological awareness has been established as important for Chinese literacy development (e.g., Ho & Bryant, 1997a; McBride-Chang & Kail, 2002; Siok & Fletcher, 2001). As Study 3 showed, maternal Pinyin mediation was significantly associated with tone awareness. Chinese Pinyin generally represents a syllable, and by convention, this syllable could be separated into onset, rime and tone; simultaneously,

each letter in Pinyin corresponds to a phoneme (Siok & Fletcher, 2001). Competent Pinyin mediation is likely to contain all of these components and even more, such as the organization of these Pinyin components, such as structure and position.

In addition, the relation between Pinyin mediation and children's independent Pinyin knowledge could be bidirectional. It could be that Pinyin mediation promotes children's Pinyin skills, but it also could be that mothers mediate Pinyin knowledge according to children's individual levels. The self-developed scale credited the highest scores to mothers who paid more attention to phonological sensitivity at finer-grained levels, and these may, in turn, relate to Chinese literacy skills. The specific associations among maternal Pinyin mediation, children's independent Pinyin skills, phonological awareness including tone, syllable, onset, and rime, and reading and writing may be further explored with diverse tasks and methodologies in future studies.

Maternal mediation of writing in Chinese compared to alphabetic scripts

As the Chinese literate and print mediation scales were adapted and developed from a Hebrew alphabetic focus (Aram & Levin, 2001), it is interesting to consider overlaps and differences between them. To begin with, the adapted print mediation scale is largely the same in content as the Hebrew scale, including the strategies and the orders. However, its associations with reading and writing skills were relatively low, compared with the Hebrew one, partly reflecting the distinct opaque characteristics of Chinese script that may cause mothers to use a copy strategy predominantly, thus demonstrating less variability in relation to literacy skills as

compared to the Hebrew transparent one.

Comparisons for the literate mediation scale should be considered separately across the two separate scales. I developed two literate mediation scales in the present studies, one for Chinese character mediation and the other for Chinese Pinyin mediation. The Chinese character literate mediation scale reflected the uniquenesses of Chinese writing. First, Chinese mothers heavily focused on strokes, the smallest units of Chinese characters. Second, some mothers liked to visualize the character or part of the character because Chinese characters are relatively picturable. Third, segmenting characters into different components, pointing out the positions of each component, and explaining radical functions especially reflect the unique features of Chinese characters because of the large proportion (90%) of semantic-phonetic compound characters. Fourth, Chinese words are rich in lexical compounding, and indeed we found Chinese mothers great use of word level comparisons, including comments on the presence of homophones, homographs, visually similar words, or reverse-ordered words. All of these strategies did not appear in the Hebrew literate mediation scale. It is difficult to directly compare each strategy appeared in literate mediation scale across Chinese and the Hebrew alphabetic scripts, because In Chinese there are around 600 stroke-patterns (Shanghai Jiaotong University, 1988), 200 semantic radicals and 800 phonetic radicals (Hoosain, 1991) composing various Chinese characters, whereas in Hebrew there are only 27 Hebrew letters forming different words. However, the associations of the newly developed Chinese literate mediation scale to Chinese literacy skills were found to be similarly strong as

compared to previous work with Hebrew (Aram & Levin, 2001; 2004).

The Pinyin literate mediation scale, in contrast, largely replicated the Hebrew findings. Though they differed in details, such as the unique components of onset, rime, and tone in Chinese Pinyin, the basic principles across the Pinyin and Hebrew literate mediation scales were the same. That is, holistically retrieving the whole sound represented a relatively surface and lower level of mediation, whereas the analytic and specific retrieval of phonemes served as a deep and higher level of mediation. The correlational findings were also similar across Chinese Pinyin and Hebrew, i.e., that literate mediation was strongly associated with children's independent literacy skills in both writing Chinese Pinyin and Hebrew word.

Limitations and contributions

There were some limitations in the present studies. First, this research was correlational only. Though maternal mediation of writing was found to be uniquely associated with Chinese literacy skills, no causal mechanism between maternal mediation and literacy skills could be determined. Our data in three studies may reflect bidirectional associations. For example, more analytic strategies promote higher level literacy skills; it is also possible that mothers mediate in a particular level according to children's own independent literacy skills. In future longitudinal studies and intervention studies, it may be helpful to interpret causal relation mechanisms.

Second, there are limitations related to the sampling in this research. The fact that Hong Kong participants in Study 1 and Study 2 were from different kindergartens and primary schools may confound the examination of the relations between maternal

mediation and literacy development, because teachers in different schools may teach Chinese in different ways. Moreover, the recruited kindergartner-mother pairs across Hong Kong and Beijing may not have been particularly well-matched, in that Hong Kong mother-child dyads were from middle SES families, whereas Beijing mother-child dyads were from middle to high SES families. In addition, the samples in the present studies were small. Partly for this reason, variables entered into the regression analyses as controls included only those deemed as most important; thus, some other demographic variables, such as gender or father's education level, may be analyzed in the future with a larger sample size.

Third, though I discussed indirect and direct effects of literate mediation in both character writing and Pinyin writing, I only tested the mediation effect for maternal mediation of character writing. With a larger sample, more complex statistical analyses, such as path analyses or structural equation models, might be conducted to test the whole picture among maternal mediation of writing, metalinguistic awareness, and Chinese reading and writing development.

Fourth, the Pinyin mediation scale was self-developed theoretically. Although it had good inter-rater reliabilities, it is important for future research to further investigate, validate, and replicate the scales in independent work. Moreover, this Pinyin mediation scale may need to be further refined. For example, different developmental trajectories of onset, rime and tone and different associations of onset, rime and tone with reading skills were documented in previous studies (Shu, Peng, and McBride-Chang, 2008). It may be necessary to first weight the scores of onset,

rime and tone, and then added them up. All of these await future studies.

Fifth, the present research did not take into account some other factors, for example, the immediate factors such as general atmosphere or mothers' demand for precision, and distant factors such as pre-school and school education guidelines. In the mother-child joint writing activities, I observed that some mother-child dyads did the writing activities in a warmer atmosphere whereas the atmosphere created by some other dyads was relative cold. This might be relevant to the relationship between mothers and children in that it may be associated with children's literacy skills. In addition, mothers' insistence of writing precision may be also related to children's independent literacy development. As pre-school and school education policy are different in Hong Kong and Beijing, maternal mediation strategies may also differ, thus affecting children's literacy development.

Lastly, this dissertation focused on mothers' behaviors in the joint writing activities, however, children's activities and the mother-child dynamic process were not analyzed. For example, at the initial stage of the writing interaction, mothers' mediation level may be based on children's current literacy performance. However with the children learning about Chinese writing during the interaction, mothers may apply the continent shift principle move to higher mediation levels even during these short testing phases. Future studies may code and analyze the collaborative activities from both the mothers' and children's aspects, and even the interaction processes. It would be interesting to examine different interaction processes between mothers and children across individuals and across cultures.

Despite these limitations, the present studies are the first attempts to analyze the nature of mother-child writing interaction and the role of maternal mediation for children's literacy development in Chinese. Indeed, the present studies have documented and organized various Chinese writing strategies into scales and categories. These analyses have showed interesting similarities and differences in maternal writing mediation across Hong Kong and Beijing and across age. Hong Kong mothers tended to more frequently focus on visualizing the characters and segmenting the characters into different components, but showed less attention to character structure and the whole character level when compared to Beijing mothers. In addition, Hong Kong mothers tended to respond more negatively to their children over all. Moreover, P1 mothers tended to show higher levels of mediation, both literate mediation and print mediation, than kindergarten mothers. More importantly, it further suggested that literate mediation (including character mediation and Pinyin mediation) and process comments are uniquely important in kindergarten children's literacy development across Hong Kong and Beijing.

These findings have important implications. Based on these empirical results, related advice or suggestions can be made for the benefit of educators, parents, and teachers for optimal facilitation of reading development in young children. For example, first, within the zone of proximal development, perhaps emphasis on analytic and qualitative instruction of shared writing and specific-oriented feedback should be considered in literacy training programs for preschool children. Second, culture- and age-specific focuses may be considered in children's literacy training. For

example, in training Hong Kong children's Chinese reading and writing acquisition, teachers and parents may make use of the rich information conveyed by the traditional script, and meanwhile make intra- and inter-character applications and comparisons. Moreover, different types of adult mediation may be selected as appropriate for different ages. As found for P1 children in Study 2, maternal mediation was no longer predictive of children's reading and writing. This suggests that other types of mediation, such as sentence or story guidance, rather than word-focused discussions, may be a possible beneficial way in which to interact with older children. Overall, the present research underscores the significance of maternal mediation of writing in preschool children's independent literacy development in Chinese across Hong Kong and Beijing.

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Appendix

Appendix 1. Chinese two-character words presented in maternal mediation of Chinese word-writing task in Study 1.

Order	Chinese Words	English Translation	Category (7 Categories)		Matched Pair
1	孔雀	Peacock	Homophone		(1) 孔雀-- (9) 恐龍
2	止血	To stanch	Homophone		(2) 止血-- (16) 手指
3	蜜蜂	Bee	Reverse-ordered character		(3) 蜜蜂 -- (15) 蜂蜜
4	火車	Train	One matched character		(4) 火車 -- (8) 貨車
5	信紙	Letter pad	One matched character		(5) 信紙 -- (10) 信封
6	她們	Them (female)	Same phonetic component	Different semantic component	(6) 她們 -- (20) 他們
7	汽車	Car	Similar Pronunciation		(7) 汽車-- (14) 起床
8	貨車	Truck	One matched character		(8) 貨車 -- (4) 火車
9	恐龍	Dinosaur	Homophone		(9) 恐龍 -- (1) 孔雀
10	信封	Envelope	One matched character		(10) 信封 -- (5) 信紙
11	太空	Space	Visually similar character		(11) 太空-- (22) 大人
12	免費	Free	Visually similar character		(12) 免費-- (18) 兔子
13	銀行	Bank	Homograph		(13) 銀行-- (17) 行李
14	起床	To get up	Similar Pronunciation		(14) 起床 -- (7) 汽車
15	蜂蜜	Honey	Reverse-ordered character		(15) 蜂蜜-- (3) 蜜蜂
16	手指	Finger	Homophone		(16) 手指-- (2) 止血
17	行李	Luggage	Homograph		(17) 行李 -- (13) 銀行
18	兔子	Rabbit	Visually similar character		(18) 兔子-- (12) 免費
19	眼睛	Eye	Same phonetic component	Different semantic component	(19) 眼睛-- (21) 晴天
20	他們	Them (male)	Same phonetic component	Different semantic component	(20) 他們-- (6) 她們
21	晴天	Sunny day	Same phonetic component	Different semantic component	(21) 晴天-- (19) 眼睛
22	大人	Adult	Visually similar character		(22) 大人-- (11) 太空

Appendix 2: Chinese two-character words presented in maternal mediation for the word-writing task in Study 2.

Order	Chinese Words in traditional script	Chinese Words in simplified script	English Translation	Category (5 Categories)	Matched Pair	HK K3	Beijing K3	Beijing P1
1	孔雀	孔雀	Peacock	Homophone	(1) 孔雀-- (9) 恐龍	\	--	\
2	蘋果	苹果	Apple	Homophone	(2) 蘋果-- (7) 花瓶	\	\	\
3	免費	免费	Free	Visually similar character	(3) 免費 -- (5) 兔子	\	---	\
4	他們	他们	Them (male)	Same phonetic component Different semantic component	(4) 他們 -- (11) 她們	\	\	\
5	兔子	兔子	Rabbit	Visually similar character	(5) 兔子-- (3) 免費	\	--	\
6	蜜蜂	蜜蜂	Bee	Reverse-ordered character	(6) 蜜蜂 -- (12) 蜂蜜	\	\	\
7	花瓶	花瓶	Vase	Homophone	(7) 花瓶 -- (2) 蘋果	\	\	\
8	行李	行李	Luggage	Homograph	(8) 行李 -- (10) 銀行	\	\	\
9	恐龍	恐龙	Dinosaur	Homophone	(9) 恐龍 -- (1) 孔雀	\	--	\
10	銀行	银行	Bank	Homograph	(10) 銀行 -- (8) 行李	\	\	\
11	她們	她们	They (female)	Same phonetic component Different semantic component	(11) 她們 -- (4) 他們	\	\	\
12	蜂蜜	蜂蜜	Honey	Reverse-ordered character	(12) 蜂蜜 -- (6) 蜜蜂	\	\	\

Note: Word marked with \ means that the word was applied by that group of children and their mothers in the maternal mediation task.

Appendix 3: Words presented in the Chinese word-writing task in Study 2.

Order	Chinese Words in traditional script	Chinese words in simplified script	English Translation	HK K3	Beijing K3	Beijing P1
1	口	口	mouth	√	√	√
2	八	八	Eight	√	√	√
3	馬	马	house	√	√	√
4	雲	云	cloud	√	--	√
5	王子	王子	prince	√	√	√
6	公主	公主	princess	√	√	√
7	手指	手指	finger	√	√	√
8	止血	止血	stanching	√	√	√
9	晴天	晴天	sunshine	√	√	√
10	讀書	读书	reading	√	--	√
11	眼睛	眼睛	Eye	√	√	√
12	起來	起来	getting up	√	--	√
13	音樂	音乐	music	√	--	√
14	蘭花	兰花	orchid	√	√	√

Note: Word marked with √ means that word was applied by that group of children and their mothers in the maternal mediation task.

Appendix 4: Chinese Pinyin words presented in the mother-child joint writing task in Study 3.

Order	Chinese Pinyin	Corresponding characters	English Translation
1	huáng guā	黄瓜	cucumber
2	qié zi	茄子	eggplant
3	qīng wā	青蛙	frog
4	xuě jiā	雪茄	cigar
5	qīng tíng	蜻蜓	dragonfly
6	luó bo	萝卜	radish

Appendix 5: Pinyin mediation coding schema in study 3.

a. *onset*

0. mother does not mention of onset phoneme or says English letter instead
1. mother separates the onset phoneme

b. *rime*

0. mother does not mention of rime or says English letter(s) instead
1. mother says the entry rime but not any phoneme in the rime
2. mother separates part of the phoneme(s) in the rime
3. mother separates each of the phoneme(s) in the rime

c. *tone*

0. mother does not mediated on tone
1. mother retrieves the tone
2. mother retrieves the tone and further says the specific place the tone should be indicated

d. *integration_1*

0. mother does not utter the whole pinyin sound
1. mother utters the whole pinyin sound
2. mother utters onset, rime and tone and connects them together

f *integration_2*

0. mother does not utter the whole pinyin sound
1. mother broadly compares the target pinyin to others
2. mother specifically compares onset, rime or tone to others

Note: There were 12 Pinyin words in the Pinyin mediation task, and coding was based on each Pinyin segment, such as huáng. The highest score for each Pinyin word mediation was 10 points.