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Relationship Between Riddles and Text Comprehension

Running Head: THE RELATIONSHIP BETWEEN APPRECIATION OF RIDDLES
AND CHINESE TEXT COMPREHENSION IN CHILDREN

**The Relationship between Appreciation of Riddles and
Chinese Text Comprehension in Children**

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Abstract

The present study investigated (1) the role of riddle appreciation and reading accuracy in Chinese written text comprehension, and (2) relationship between different types of riddles and Chinese written text comprehension in 40 Cantonese-speaking children aged 9;0 to 11;0 studying in Grade 4. Due to the imperative role of metalinguistic knowledge and riddle appreciation, it was hypothesized that riddle appreciation would show high correlation with Chinese written text comprehension. The findings supported the hypothesis and previous literature that both riddle appreciation and reading accuracy were closely related to Chinese written text comprehension. Regression analyses indicated a significant linear relationship only between riddle appreciation and written text comprehension. Among lexical, morphological, orthographic, phonological, pragmatic and syntactic riddles, all riddles except phonological and pragmatic riddles were found to be significantly correlated with Chinese text comprehension. Specifically, orthographic riddles demonstrated the strongest correlation. Based on these findings, the crucial and practical role of riddle appreciation in text comprehension was highlighted.

Introduction

The reason of reading is to derive meaning from text. If readers can read words aloud without comprehending what they have read, they are not actually reading. For example, readers read user's manual for the operation of a new product in order to understand how to use the product. Text comprehension requires a hierarchy of skills (Ukrainetz, 2006). Many studies have referred to the work of Gough and Tunmer (1986) *Simple View of Reading* when defining text comprehension (e.g. Hoover & Gough, 1990; Stothard & Hulme, 1996; Shankweiler et al., 1999): "reading consists of only two parts, decoding and linguistic comprehension" (Hoover & Gough, 1990, p.32). Decoding refers to the ability to recognize words by mapping their alphabetic forms and orthographic representations, and retrieving the semantic information of the word (Hoover & Gough, 1990; Gough, Hoover & Peterson, 1996; Shankweiler et al.; 1999, Shu, 2003). Linguistic comprehension refers to the process of extracting and constructing meanings from words and interpreting sentences, passages and discourse (Hoover & Gough, 1990; Gough, Hoover & Peterson, 1996; Ukrainetz, 2006). According to the *Simple View of Reading* model, the process of linguistic comprehension is shared by both written and auditory text comprehension except the difference between visual and auditory stimuli presented (Hoover & Gough, 1990; Gough, Hoover & Peterson, 1996). Along with working memory, readers integrate linguistic knowledge, world knowledge and social contexts to understand text and achieve successful text comprehension (Cain, Oakhill

& Bryant, 2004; Johnston, Barnes & Desrochers, 2008; Ukrainetz, 2006).

The role of decoding skills in text comprehension has been widely studied. Much research focused on the association between text comprehension ability and skills in processing basic units, such as phonological awareness, vocabulary, grammar and word recognition (Cain et al., 2004; Nation & Snowling, 1998; Dahl & Scharer, 2000). Consistent findings have demonstrated that these decoding skills could predict text comprehension skills in elementary school age children (Gough, Hoover & Peterson, 1996; Cain et al., 2004; Megherbi, Seigneuric & Ehrlich, 2006; Roch & Levorato, 2009). Because of this predictive power, many educators included training of decoding skills as an essential component of the literacy programs (Dahl & Scharer, 2000; Lovett, Lacerenza, & Borden, 2000; Snow, 2002). For example, phonological awareness or phonics instruction was used to enhance children's reading ability starting with the identification of basic linguistic components (i.e., sounds and corresponding letters in text) (Dahl & Scharer, 2000; M.C. Brooks & J.S. Brooks, 2005).

Other components of text comprehension, on the other hand, received much less attention in the literature in comparison to the decoding skills. In reading more complex texts, such as expository texts and stories, readers draw on inference making skills to identify main ideas and relate new information to prior knowledge. In order to make inferences, readers need to integrate information from sentences in a text, extract explicit and implicit meanings from the sentences and finally form a representation of what the whole text is about (Yuill &

Oakhill, 1991). Bishop (1997) proposed that an “integrated mental model” was important for the integration of information by using one’s episodic memory and general knowledge about real world situations and events. This “integrated mental model” assists the comprehension processes by understanding the situation and event constructed in a text. As a result, text comprehension requires not only decoding skills, but also retrieval of linguistic and world knowledge, and integration skills that put different pieces of information together (Yuill & Oakhill, 1991; Bishop, 1997).

Yuill and Oakhill (1988) conducted an efficacy study and highlighted the importance of inference training and comprehension exercises in reading comprehension. In their study, 26 children who belonged to less skilled comprehenders were assigned to either one of the three treatment groups: (1) inference-training group, (2) comprehension exercise group, and (3) rapid-decoding group. It was found that less skilled comprehenders in the inference-training group made more significant improvement than participants in the rapid-decoding group. Those in inference-training group also made more, but not significant, improvement than participants in comprehension exercise group. The improvement made by the participants in inference-training group supported the contribution of inferencing processes in reading comprehension.

Metalinguistic Awareness and Inferences

Metalinguistic awareness refers to the knowledge about processes and rules of language

(Yuill, 1996). The role of metalinguistic awareness in the process of drawing inferences is clear. For example, when a listener has to infer the appropriate meaning of a homophone in a sentence, he or she has to be aware of the multiple meanings of a word and determine which meaning is more relevant with reference to the context (e.g., river *bank* vs. saving *bank*).

Appreciation of riddles

Oakhill, Yuill and Donaldson (1990) suggested that poor readers showing weaker inference-making skills often demonstrated deficient metalinguistic skills. These children in turn were expected to have weaker ability in drawing the relation between literal and intended meaning. With this assumption, Yuill (1996) examined the relationship between children's ability in re-interpreting ambiguity in joke riddles and reading comprehension.

Appreciation of riddles is a task taxing heavy metalinguistic skill. In order to fully understand the meaning of riddles, a listener is required to detect the ambiguous or alternative interpretations of the riddles in addition to the literal interpretation (Shultz, 1974; Yuill, 1996). In the study conducted by Yuill (1996), a positive correlation was found such that children good at recalling riddles often possessed stronger reading ability. Yuill (1996) also investigated the relationship between text comprehension and comprehension of different types of riddles, including phonological, lexical, word compound, syntactic, pragmatic, metalinguistic and absurd riddles, in typical school-age children. Among different types of riddles, lexical, word compound, pragmatic and metalinguistic riddles were more closely

related to reading comprehension (Yuill, 1996). In three subsequent intervention studies, Yuill (2007, 2009) and Zipke, Ehri and Cairns (2009) made use of understanding of lexical and syntactic riddles as a strategy in a treatment program for improving text comprehension in a group of poor readers at primary grades. Positive outcome was reported in these studies.

These findings highlighted the importance of inference making, specifically the role of riddles, in text comprehension, and underlined similar underlying processes required in these two tasks.

Chinese Text Comprehension

When compared to the considerable literature of text comprehension in English, related research in Chinese children is nearly lacking. One study by Leong, Hau, Tse and Loh (2007) employed the structural equation modeling technique to explore the roles of (1) verbal working memory, (2) pseudo-word reading, (3) rapid automatized naming, and (4) phonological segmentation in inferential text comprehension in a group of Chinese poor comprehenders. Pseudo-word reading and verbal working memory were found to show moderately high correlation with text comprehension. The pseudo-words Leong et al. (2007) designed were combinations of two real pronounceable characters into meaningless Chinese pseudo-words. Leong et al. found that the phonologic-orthographic properties of pseudo-words related to how one read and comprehended Chinese text. However, despite the significant role of metalinguistic process and inferences in text comprehension as mentioned

above, Leong et al. (2007) only focused on decoding skills and did not take into account these higher level skills in their conceptual model.

Aims of the Present Study

Building on previous studies on the relationship of metalinguistic skills and text comprehension, the present study aimed to directly investigate the role of inference-making skills and decoding skills in Chinese written text comprehension in Cantonese-speaking children. To be more specific, the relative contribution of (1) riddle appreciation skills, and (2) Chinese word reading accuracy to Chinese written text comprehension was explored. In particular, given the imperative role of inference making and riddle appreciation in text comprehension, the present study also focused on whether riddles in Chinese also showed similar relationship in text comprehension. In addition, the present study also investigated the relationship between different types of riddles and Chinese text comprehension.

Method

Participants

Forty 9- to 11-year-old Cantonese-speaking school-students with 20 boys and 20 girls at Grade 4 were recruited from four primary schools in Hong Kong. All the participants had no reported history of speech and language, hearing or psychological problem.

Materials

Each student was required to participate in four tasks: (1) an auditory text comprehension

test, (2) a written text comprehension, (3) a riddle appreciation task, and (4) a reading accuracy test.

Auditory text comprehension test

To ensure that the listening comprehension performance of each participant was age appropriate, all participants' auditory text comprehension was examined using the Textual Comprehension Test in the Hong Kong Cantonese Oral Language Assessment Scale (T'sou et al., 2006). In this test, the students were required to listen to two passages. Each passage was followed by questions including a set of literal questions, inference questions and questions about meaning of vocabulary in the text. All participants scored no lower than 1.25 *SD* below the mean, and was considered age appropriate in this subtest.

Written text comprehension task

Territory-wide System Assessment (TSA) is an assessment developed to provide information about school standards in Chinese Language, English Language and Mathematics for the purpose of improving effective learning and teaching at schools (Hong Kong Examinations and Assessment Authority, n.d.). TSA was also designed based on key learning areas that children should have acquired at different grades in the curriculum ("Basic Competency", n.d.; Hong Kong Examinations and Assessment Authority, n.d.). Based on the most recent four years (i.e., years 2007, 2008, 2009 and 2010) of TSA of Chinese written text comprehension at Grade 3 and Grade 6 levels by the Hong Kong Examinations and

Assessment Authority, two text passages were constructed at an intermediate level and represented in traditional Chinese characters. Constructing new text passages using TSA as reference could minimize the effect of any prior learning. Taken the study by Leong et al. (2007) as reference, each passage reading was followed by six open-ended inferencing questions: two literal inferencing questions, two coherence inferencing questions and two elaboration inferencing questions. Literal inferencing required readers to make use of their linguistic knowledge to search for relevant words and phrases in the text; coherence inferencing required the readers to integrate propositions and interpret the underlying implications; and elaboration inferencing required the readers to integrate different concepts and read beyond the stated messages in the text (Leong et al., 2007). A marking scheme was developed and a score of two was awarded according to the accuracy, clarity, completeness and relevance of written answer to each question. The maximum score for the written text comprehension task was 24 (2 passages x 2 marks for 6 questions per passage).

To ensure that the constructed written text comprehension task and the marking scheme were developmentally sensitive, 30 students at Grades 2, 4, and 6 with 5 boys and 5 girls in each grade were recruited from the schools to perform the task. A strong and significant positive correlation was found between grade level and the total scores of the written text comprehension test ($r=.89, p<.01$). In addition, six randomly-chosen passages were scored blind by a second marker with 86% agreement. Both the developmentally sensitiveness and the

high inter-rater reliability reflected that the written task devised was basically valid and reliable.

Riddle appreciation task

Given the differences between the writing systems of English and Chinese (Shu, 2003), two modifications in the types of riddles were made using the study by Yuill (1996) as a reference. Firstly, as orthographic knowledge was essential in Chinese reading and writing (Shu, 2003), orthographic riddles were included in addition to phonological, lexical, syntactic, morphological and pragmatic riddles. Secondly, as metalinguistic awareness was required to understand riddles with multiple meanings (Yuill, 1996), this component was incorporated into all riddles, and metalinguistic riddles did not remain in the present study. As a result, six types of riddles were used, including phonological, orthographic, lexical, morphological, syntactic and pragmatic riddles, with seven examples of each type. This yielded a total of 42 riddles.

English examples of each type of riddles taken from Yuill (1996) are shown in Table 1 (see Appendix A for Chinese examples of riddles with English translation and explanation). According to the classification and examples given in Yuill (1996), phonological riddles were the lowest level of riddles, which contained homophones by replacing a similar sounding morpheme. Orthographic riddles required decomposition of characters and required knowledge of Chinese character orthography (Shu, 2003). Lexical riddles involved the understanding of double meanings of words that shared the same character and same word class (Yuill, 1996).

Morphological riddles were similar to the word compound types used by Yuill (1996), and relied on multiple interpretation of compound words by understanding the decomposed lexical structure of the constituent morphemes (Zhou, Marslen-Wilson, Taft, & Shu, 1999). Syntactic riddles consisted of syntactic ambiguity (Yuill, 1996) either by the change of word class using word segmentation, or ellipsis of a word or phrase. Pragmatic riddles referred to riddles that were out of the listener's expectation about the speaker's intent (Yuill, 1996). Either the speaker gave too much specific details in a statement, or did not follow general presupposition of an utterance (Yuill, 1996).

Table 1

English Examples of Riddles used in the Study by Yuill (1996)

Phonological riddles:

What kind of keys are furry? Monkeys

Lexical riddles:

Why do leopards never escape from the zoo? Because they are always spotted

Morphological riddles:

Why did girl tiptoe past the medicine cabinet? She didn't want to wake the sleeping pills.

Syntactic riddles:

What animal can jump higher than a tree? All animals. (Tree can't jump)

Pragmatic riddles:

When is a black dog most likely to go into a house? When the door is open

To ensure the accuracy of riddle type classification, all riddles were re-classified by another undergraduate student in the Division of Speech and Hearing Sciences at The

University of Hong Kong. There was disagreement on less than 8 percent of classification, and the disagreement was resolved after discussion.

In order to assess riddle appreciation ability, riddle retelling and explanation tasks were used. The riddle answers provided to the children were in a declarative form without any further elaboration and explanation. The children were told that the investigator did not understand the riddles, and the task involved them to explain the answers they retold with prompting question (i.e., could you explain clearer on that). One score was given to each recall and one score was given if the students could use their own words to explain the ambiguity of riddles.

Reading accuracy test

The students' reading ability was tested using the Hong Kong Graded Character Naming Test (HKGCNT) (Leung, Cheng-Lai & Kwan, 2008). HKGCNT is a standardized Chinese word recognition test used to assess children's character naming ability. In this task, the participants were asked to read 150 single Chinese characters of the Grade 4 subtest. One mark was given to each correct item.

Procedures

The written comprehension task was conducted in group. Children were asked to read the two printed text passages silently and answer the questions by writing their answers in the space provided without worrying about their writing.

The experimental tasks of riddle appreciation, reading accuracy and auditory text comprehension were carried out on an individual basis. The riddles were recorded and incorporated randomly into a PowerPoint presentation format. Each riddle question was first presented to the child, and he/she was encouraged to guess the answer. Regardless of the accuracy of the child's response, the answer corresponding to the riddle question was then presented to him/her. Afterwards, after all the riddles were presented to the child once, the reading accuracy task and auditory text comprehension task were administered. The tasks of riddle appreciation by retelling and explanation were conducted at the end of the session. The arrangement was to minimize the effect of rote memory on recall of riddle answers. The whole session was audio-recorded, and all responses from riddle retell and explanation were transcribed verbatim.

Thirteen percent (6/46) of the riddle retell and explanation was re-scored by another rater to investigate inter-rater reliability. Riddle retell scores were coded with 100% agreement and riddle explanation were coded with 98% agreement. The remaining sessions were coded by a single coder.

Results

Descriptive statistics of each subtest are summarized in Table 2. The data showed a divergence between riddle retell and riddle explanation performance. It should be kept in mind that the performance in riddle retell appeared to be subject to a ceiling effect.

Table 2

Mean Scores, Standard Deviation and Maximum Scores of All Subtests

Tasks	Maximum score	Mean	SD
Written text comprehension	24	17.13	3.60
Reading accuracy	150	119.78	15.55
Riddle retell	42	36.83	3.65
Riddle explanation	42	24.85	6.78

Association between Chinese Text Comprehension and Reading Accuracy, Riddle Retell and Riddle Explanation

Univariate analysis

In order to investigate whether reading accuracy, riddle retell and riddle explanation were associated with Chinese written text comprehension, Pearson's correlation coefficients of all these tasks with written text comprehension were calculated (see Table 3).

All the three tasks showed a significant positive correlation with Chinese written text comprehension. The performance of riddle explanation demonstrated the strongest correlation ($r=.69, p<.001$). The correlation between riddle retell and written text comprehension was weaker than riddle explanation ($r=.36, p<.05$). The correlation of reading accuracy with written text comprehension was $.56 (p<.001)$.

Table 3

Correlations between Chinese Written Text Comprehension and Riddle Explanation, Riddle Retell, and Reading Accuracy

Measure (n=40)	Riddle explanation	Riddle retell	Reading accuracy
Written text comp	.69***	.36*	.56***

* $p < .05$ (2-tailed), ** $p < .01$ (2-tailed), *** $p < .001$ (2-tailed)

Hierarchical multiple regression

Given the significant univariate correlations of the three tasks with written text comprehension, all the three variables were subject to a multiple hierarchical regression. A direct entry method was used and the order of variables was entered according to the strength of correlation coefficients, that was, (1) riddle explanation, (2) reading accuracy, and finally (3) riddle retell. Table 4 illustrates the results of the regression analysis.

With all the three variables entered into the regression analysis, the final model explained approximately 53% of the variance in Chinese written text comprehension, and the overall model was significant ($F(3,36)=13.63, p < .001$). When riddle explanation was first entered into the regression analysis, the model with this single variable had already explained most of the variance (47% out of 53%). When reading accuracy was entered, it accounted for an additional 2% of the variance. Riddle retell was then entered in the final model and accounted for an additional 4% of variance in written text comprehension. However, the contribution of both reading accuracy and riddle retell were statistically insignificant.

The unstandardized coefficients (B) in the regression model shown in Table 4 indicated

the strength and the direction of the prediction power of the independent variables. The *B*-value of riddle explanation in the final model is 0.44, which suggested a positive relationship between the riddle explanation performance and the Chinese written text comprehension. With the effects of reading accuracy and riddle retell being controlled, the value indicated that as riddle explanation increases by one score, text comprehension increases by 0.44 score.

Table 4

Results of Hierarchical Regression Analysis

	Unstandardized coefficients					
	<i>R</i> ²	Model sig.	<i>B</i>	Std. Error	<i>t</i>	<i>p</i> value
Model 1	.47	<.001				
Constant			8.04	1.61	4.99	<.001
Riddle explanation			0.37	0.06	5.85	<.001
Model 2	.02	<.001				
Constant			4.90	3.41	1.44	.16
Riddle explanation			0.31	0.09	3.61	<.01
Reading accuracy			0.04	0.04	1.04	.30
Model 3	.04	<.001				
Constant			13.64	5.82	2.34	.03
Riddle explanation			0.44	0.11	4.00	<.001
Reading accuracy			0.03	0.04	0.88	.38
Riddle retell			-0.30	0.17	-1.82	.08

Correlation between Different Types of Riddles and Chinese Written Text Comprehension

To examine the relationship between different types of riddles and Chinese written text comprehension, correlation coefficients were computed. Table 5 displays the percentage of accuracy of riddle explanation for each riddle type, and the correlations with written text comprehension scores in terms of Pearson's r .

The performance of all types of riddle explanation except phonological riddles showed significant positive correlations with text comprehension. Among the six types of riddles, orthographic riddle explanation was found to show the strongest correlation ($r=.66, p<.001$). Syntactic, morphological and lexical riddle explanation showed moderate correlations with written text comprehension. In addition, the correlations between written text comprehension and pragmatic and phonological riddle explanation were positive but insignificant.

Table 5

Descriptive Statistics and Correlations (Pearson's r) between the Explanation Task of Riddle Types and Written Text Comprehension

Riddle type	Mean (Max = 7)	SD	Correlation r
Orthographic	3.38	2.13	.66***
Syntactic	3.60	1.63	.59***
Morphological	3.98	1.73	.53***
Lexical	4.47	1.49	.52**
Pragmatic	6.25	0.93	.27
Phonological	3.23	1.21	.26

* $p<.05$ (2-tailed), ** $p<.01$ (2-tailed), *** $p<.001$ (2-tailed)

Discussion

Recall that the present study had two main objectives. Firstly, the contribution of reading accuracy and riddle appreciation to Chinese text comprehension was presented and followed by the prediction of written text comprehension by these variables. Secondly, the correlation between different types of riddles and Chinese written text comprehension was investigated.

Contribution of Reading Accuracy, Riddle Retell and Riddle Explanation to Chinese

Written Text Comprehension

In the present study, Chinese written text comprehension was found to be associated with reading accuracy, riddle retell and riddle explanation in the univariate analyses. When all the three variables were considered simultaneously in a multivariate analysis, only riddle explanation was a useful predictor of a child's written text comprehension performance, and decoding skills and riddle retell were no longer useful.

Previous studies on text comprehension in both English and Chinese have highlighted the importance of word recognition skills, verbal and semantic skills in reading comprehension (Hoover & Gough, 1990; Nation & Snowling, 1998; Shankweiler et al., 1999). The present findings appeared to be in conflict with previous research such that reading accuracy did not contribute to written text comprehension. Such a discrepancy could be explained by the difference in (1) the inclusion of variables, and (2) the grade levels of the participants between the present study and previous studies.

Firstly, when variables are analyzed together, variables that do not have any unique contribution will no longer be significant as other variables have already accounted for their effect. In the present study, by using multivariate analysis, interpretation of riddles has already drawn on many different kinds of skills, including those that were required in decoding task. In comparison to previous literature, for example, in the study conducted by Leong et al. (2007), although hierarchical multiple regression analysis was used, only decoding skills, but not the role of inferencing, were included when examining the contribution of different component skills to written text comprehension. The inclusion of decoding skills in the task of inferencing was therefore not studied. As a result, in the present study, because of the inclusion of decoding skills in riddle explanation, only riddle explanation showed significant contribution to written text comprehension.

Grade differences of participants recruited in previous and the present studies also led to inconsistency of the results. Shankweiler et al. (1999) and Megherbi, Seigneuric and Ehrlich (2006) showed strong association between word decoding skills and reading comprehension in English speaking children aged 7;5 to 9;5 in early school grades (around Grade 2 to Grade 3). The correlation decreased as the children grew up. Although word decoding also showed positive correlations with written text comprehension in grade 4 children in their studies, the correlations were only moderate. In the present study, children aged 9;0 to 11;0 in grade 4 were recruited. It is possible that word decoding skills showed less contribution to written text

comprehension in grade 4 students compared to younger children. Text comprehension required more than these lower level skills, and involved higher level processing with its known involvement of metalinguistic awareness and inference making skills. As a result, riddle appreciation through riddle explanation was a more powerful predictor than reading accuracy in written text comprehension.

In general, the present studies showed further support to the efficacy studies by Yuill and Oakhill (1988), Yuill (1996), Zipke (2008) and Zipke et al. (2009) on the improvement of inference skills in written comprehension with the use of riddle training. However, the negative, but insignificant, correlation between riddle retell and text comprehension was somewhat unexpected. It appeared that children relied on memory to retell the riddles without analysis. The ability to interpret and explain riddles was therefore shown to be a better indicator to assess riddle appreciation than riddle retell.

Relationship between Explanation of Different Types of Riddles and Chinese Written

Text Comprehension

Among different types of riddle explanation, orthographic riddles demonstrated the strongest correlation with Chinese written text comprehension. This type of riddle is specific to Chinese and is very common in children's riddles. The contribution of orthographic riddles was consistent with the study conducted by Leong et al. (2007) that there was a relationship between pseudo-word reading and written text comprehension. In order to accomplish

orthographic riddle explanation and pseudo-word reading tasks, one needed to understand subcharacter components (e.g. Chinese semantic and phonetic radicals), orthographic rules and vocabulary knowledge (Shu, 2003; Leong et al., 2007). This knowledge required metalinguistic awareness and was reported to affect written text comprehension (Leong et al., 2007).

The present study found that morphological and lexical riddles significantly associated with Chinese text comprehension. This pattern was consistent with previous study by Yuill (1996), who also found significant correlations between appreciation of these riddles and reading comprehension. These types of riddles drew on children's metalinguistic skills in analyzing the language as a subject. For comprehension and explanation of a morphological riddle, children had to understand the semantic information of constituent morphemes that form the compound words. Interpretation of lexical riddles required children to be sensitive to multiple meanings of a word (Yuill, 1996). Children had to identify the accurate word meaning according to the context and explain the ambiguity at word levels in lexical riddles. Both morphological and lexical riddle analyses and written text comprehension relied on the children's metalinguistic awareness and the ability to make inferences.

The absence of significant correlation between phonological riddle appreciation and written text comprehension was found in both the present study and in Yuill (1996). As suggested by Yuill (1996), phonological riddles were considered as sublexical riddles, and were more closely related to reading accuracy. Ho and Ma (1999) also suggested the role of

phonological knowledge in word reading indirectly in an efficacy study in Chinese children with dyslexia who showed poor performance in the reading accuracy task. As a result, compared to other types of riddles, the interpretation of phonological riddles required even less metalinguistic awareness, and relied on lower level decoding skills of phonological awareness.

Differences in findings between the present study and research by Yuill (1996) were found. The present study showed that syntactic riddle explanation was closely related to written text comprehension, but such a correlation was not found in Yuill (1996). Schultz suggested that children's ability to detect syntactic ambiguities emerged at around age 12. The children included in the present study were older than those in the study by Yuill (1996) (age 9;0-11;0 vs. age 7;10-9;9). Therefore, the contribution of the syntactic riddles to text comprehension was more apparent in the present study.

In the present study, pragmatic riddle explanation showed an insignificant correlation with Chinese written text comprehension, while a significant mild correlation was found in Yuill (1996). Although interpretation of pragmatic riddles relied heavily on the retrieval of episodic memory and world knowledge to establish the "mental model" for comprehension (Bishop, 1997; Yuill, 1996), understanding pragmatic riddles appeared to involve less metalinguistic skills than other riddles, including orthographic, syntactic, morphological and lexical riddles. In addition, as discussed above about the age difference of the participants in the present study and in the study by Yuill (2006), the correlation between pragmatic riddle explanation and text

comprehension seemed to be more significant in younger children than in older children.

Conclusion and Future Directions

The present study showed that higher-level metalinguistic awareness was closely related to Chinese written text comprehension. As a measure of metalinguistic skill, Chinese riddle appreciation through riddle explanation well predicted Chinese written text comprehension, at least in children at 9;0 to 11;0. Written text comprehension also significantly correlated with all riddle types except phonological and pragmatic riddles. Specifically to Chinese language, orthographic riddles were found to have the strongest relationship to Chinese written text comprehension.

The study can have practical implications to Cantonese-speaking population in terms of language teaching and training. Training children's metalinguistic awareness of multiple meanings in riddles can actually facilitate children's inferencing skills. As different riddle types, including orthographic, syntactic, morphological and lexical riddles, showed significant positive correlation with Chinese written text comprehension, the use of these types of riddles may indirectly facilitate children's ability to interpret Chinese texts. Text comprehension in school can also be taught through riddle appreciation tasks. In order to use riddle appreciation, not only the children's ability to retell riddle, but their ability to explain riddles should be used as riddle explanation was found to be more representative than riddle retell.

Further research is needed in several aspects. Firstly, the present study only focused on

students at Grade 4. It appears that different level of text comprehension requires different degree of inferencing ability. Therefore, further study can examine children at different grade levels. Secondly, the role of riddle appreciation as an intervention for poor Chinese comprehenders can be explored. Pre- and post- treatment can provide evidence about the effect of riddle appreciation in text comprehension improvement. In addition, an efficacy study can also be conducted to compare the effectiveness of different training programs, such as traditional comprehension training and riddle appreciation task, to Chinese text comprehension. Last but not least, the development of riddle appreciation in Chinese can be examined. Research by Schultz (1974) about the development of riddle appreciation did not take into account morphological, pragmatic and orthographic riddle development. A research on riddle development in Chinese can identify the differences in difficulty among riddle types and across age. The prediction of written text comprehension by different types of riddles can also be investigated. These findings can be useful in designing suitable riddles as intervention for poor comprehenders from different age groups.

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Appendix A

Chinese Examples of Riddles used in the Present Study

Phonological riddles:

一隊由十人組成的軍隊去打仗，被一架坦克車射中，十名軍人全部炸死，請問仲有幾多人未死？ 十個，因為他們全部詐死

Question: An army formed by ten people went to war. They were shot by a tank. All the ten soldiers were *exploded*. How many soldiers are still alive?

Answer: Ten soldiers

Explanation: The homophone *explode* (pronounced as *zaa₃*) in Chinese is *pretend* (also pronounced as *zaa₃*), as a result, when ten soldiers pretend to die, all of them are still alive.

Lexical riddles:

有個人屋企停電，佢仲可唔可以睇電視呢？可以，可以睇住部電視機

Question: Would a person be able to *watch* television if there is a power shortage?

Answer: Yes

Explanation: The Chinese word *watch* has another meaning *see*. A person can still see the television (i.e. the television as an object vs. television program) even there is a power shortage.

Morphological riddles:

呢個世界上有男人又有女人，請問先有男人或先有女人呢？男人，因為男人係先生

Question: There are men and women in this world, which of them come first?

Answer: Men

Explanation: The compound word *Sir* (pronounced as *sin₁ saang₁*) in Chinese is composed of two characters (*sin₁* and *saang₁*), which represents *first born* (*sin₁* = first, and *saang₁*=born). As a result, *Sir* represents that men were first born, so they come first.

Orthographic riddles:

我而家想你估一個中文字，有個人喱埋□堆草同樹木中間。答案係飲茶個茶字

Question: A man hides between grass and tree. Guess a Chinese word.

Answer: Tea (pronounced as caa₄)

Explanation: This Chinese word is composed by a semantic radical representing *grass* on top, the Chinese character *people* in the middle, and the Chinese character *wood* at the bottom. As a result, it appears that a man is between grass and wood (tree) in this Chinese word.

Syntactic riddles:

要點樣跳先跳得高過棵樹？隨意跳一跳都會比樹跳得高。

Question: How can you jump higher than a tree?

Answer: You can jump higher than a tree no matter how you jump.

Explanation: Trees cannot jump.

Pragmatic riddles:

有五個人出街，但係只帶一把雨傘，返屋企後，佢地會唔會濕呢？唔會，因為冇落雨

Question: Five people went out with only one umbrella, would they get wet when they return home?

Answer: No, because it was not raining.

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